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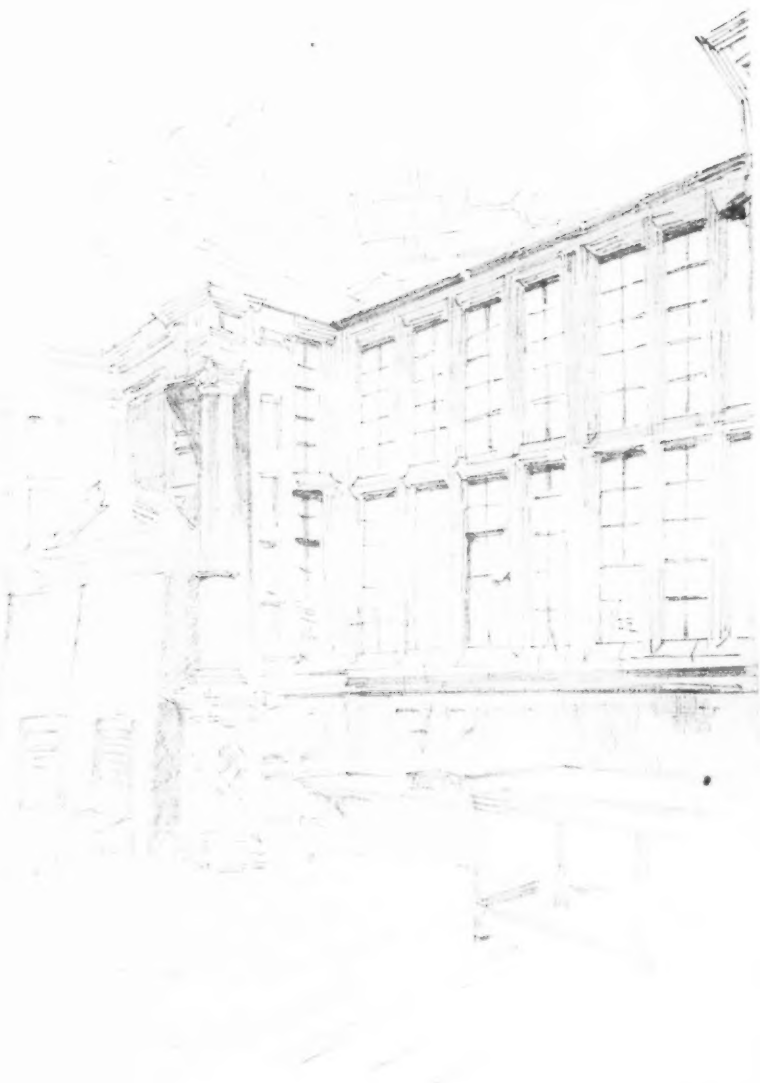

ORIGINAL DRAWING, "GLOBE ROOM," REINDEER INN, BANBURY, OXON
From the Pocket Sketch Book of R. Norman Shaw, R.A.
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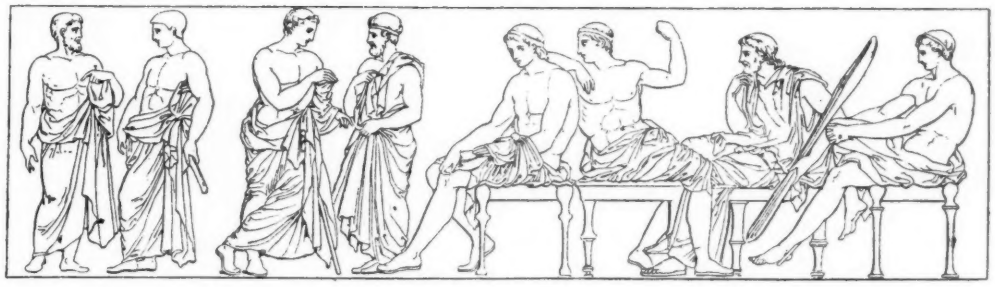

Some Principles of Ventilation and Heating

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[*Read before the Royal Institute of British Architects on Monday, 4 March* 1929]

THE Census of 1921 showed in England and Wales over 600,000 people occupying one room per family, and nearly three million occupying two rooms per family.

Sir R. Blair stated in *The Times* recently that :—

" In the inner zone of London some 300,000 people live in overcrowded conditions." So far, the new building estates have not succeeded to any appreciable extent in emptying the slums. Whatever has been done is nullified by the rate of migration into London.

The primitive healthy habitation of man in the nomad state is a wind-screen of boughs. The native Australian uses a screen of bark and creeps in with his people, his dogs and their fleas, and so secures community warming. By nomadic life unsoiled ground, water and air are obtainable.

In the case of diseases which enter by the respiratory membrane, such as catarrhs, influenza, diphtheria, measles, etc., infection is spread by droplets of saliva which are sprayed out in sneezing, coughing, and speaking. In the vast, restlessly moving air such infection does not occur ; morbidity increases with crowding indoors and continuity of exposure. In schools boarders suffer much more than day boys (owing to continuity of infection). The closer the beds in a dormitory and the less the ventilation the greater the sickness rate. Pull apart the beds and keep open the windows, the morbidity becomes less ; put the children to sleep in the open and it becomes insignificant. Small doses of infection produce mild attacks and vaccinate the body against disease. Massive, continued exposure to infection produces much disease and severe types. At Papworth Colony, owing to open-air life, none of the children of tubercular parents have been infected. In slum tenements the infection of infants and young children by tubercular parents is common.

Let me instance the case of a children's home. Run at first on old-fashioned lines there was much sickness. An additional home, an " open air " one, was built ; in this the morbidity was almost nil. Another one was added with like result ; then some one with the old-fashioned fear of cold got control of the committee, and a fourth home was built on the indoors plan. Herein the morbidity was as high as in the first. What a lesson for committees of management and architects. Schools as at present built are places which improve the manners and sharpen the mind, but damage vigour and health. When an epidemic is going round they have to be closed. They all should be built as open-air schools. Debilitated, rickety children taken from slums are made robust, happy and teachable by living and sleeping either in the open air or in an open-air shelter all the winter without any artificial heat other than that used for warming food and drying clothes. This, too, in such a place as Salford. Given good plain food, open-air life, adequate clothes, the hardening process results in overcoats being discarded and splendid health.

During the Great War our citizen soldiers, taken from shop, office, and factory, were quickly hardened off by open-air life and turned from weaklings to robust men. In the trenches they were exposed to cold and damp to the utmost degree of discomfort, but were well fed and clothed. They did not suffer from respiratory catarrhs, pneumonia, or rheumatic fever, although they got trench feet and stiff, painful muscles. The Indians, brought from the tropics, were at first incapacitated as fighters from cold, but they did not die from pneumonia or rheumatic fever, and finally, with the help of good food and clothes, won through to acclimatisation and efficiency.

Children made rickety, tubercular, damaged by rheumatic fever through the filthy, dark conditions indoors, are restored by living and sleeping in open-air shelters and by plenty of simple, natural foods, milk, eggs, green food, fruit.

It is the crowding in stuffy, dirty, artificially-heated rooms that works the mischief, together with a diet deficient in essential principles, viz. one composed of white bread, margarine, sugar, and meat.

The tribes of the Himalayan slopes, feeding on protective foods, milk, vegetables, and fruit, and living open-air lives, suffer from none of those diseases which so commonly affect city people, tonsilitis, appendicitis, tooth decay, etc. The indoor life in houses not only increases droplet infection and disease spread by vermin, but has an ill effect on the respiratory membrane through the inhalation of house dust. Moreover, artificial heat and overclothing lowers the body heat production and so diminishes vitality, appetite, and good health. The house and clothes screen us from sunlight, which naturally acts on the naked skin of the wild man. The skin, a most important organ of defence against disease, is kept in good health by exposure to light and open air.

It has been supposed and widely taught in popular books of domestic hygiene that an ill-ventilated room causes discomfort and ill-health through chemical alteration of the air, that the air is impoverished of oxygen and polluted with exhaled carbonic acid and some subtle organic poison given off from the bodies of people. There is no truth in these views. Exact experiment has shown that no poison is given off, and that the oxygen is neither reduced nor carbonic acid increased in an amount that matters even in the most crowded and oppressive atmosphere. Significant alteration of the oxygen and carbonic acid content of the air only takes place in hermetically closed places, such as submarines and in mines. The natural ventilation through chinks of doors and windows and porous walls and ceilings is such in any ordinary room that no alteration in the content takes place that has any physiological effect. I observed thirty soldiers in a 900 c. ft. dug-out ventilated by a stairway curtained against the entry of gas poison. After one hour, the natural ventilation induced by difference of temperature within and without (it was a cold day) had prevented the carbonic acid from rising above 0·5 per cent. or the oxygen from falling by a like amount. Such small changes in the composition of the air merely occasion a slight compensatory increase in the depth of respiration and ventilation of the lungs. In the depths of the lungs there is some 5 per cent. of carbonic acid and 14 per cent. of oxygen, and the composition of this alveolar air is automatically kept constant by the control of the breathing. At Alpine health resorts there is less oxygen breathed in each pint of air than in the most crowded, stuffy room, and sailors in submarines sunk under the sea only begin to suffer from uncomfortable depth of breathing and wish to come to the surface when the carbonic acid rises to 2 or 3 per cent.; then the oxygen is insufficient to support a flame, but they have no cognisance of this, and the air, cooled by the sea, feels fresh to an incomer. The air of a room crowded with dirty people smells offensively, but there is no chemical poison in such air. In truth, the popular belief that such air produces discomfort by chemical impurity is wholly erroneous. The discomfort arises from body heat stagnation, and is relieved by cooling and blowing about the air without any change in its chemical quality. Thus, if half-a-dozen students be shut in a very small chamber with glass observation windows, they soon become over-warm and sweat through stagnation of body heat loss. The oxygen percentage soon sinks, so that the students can no longer smoke. The air stratifies, the warm air rising to the top. If one of the students breathes by means of a tube outside air he is not relieved. If one outside breathes through a tube the inside air he is not made uncomfortable. If a cooling fan be turned on in the chamber so as to blow up the stratified cooler air from below and cool the students faces by evaporation of sweat then

immediately great relief is felt. There is no evidence that either ionisation of the air or potential gradient affects us.

Some people are, however, peculiarly sensitive to traces of foreign protein, such as dandruff of animals, pollen, moulds, and suffer from hay fever, asthma, or bronchitis from breathing such dust, just as some are sensitive to certain foods, eggs, crabs, strawberries, and have attacks of nettlerash or asthma from eating such. House dust contains moulds, particles of horse hair, wool, feathers, etc., and is then a common cause of asthma and bronchitis. To those sensitive to pollen an open window at certain times of the year may be distressing—they want to shut out the cause of their trouble. Bronchitis set up by the irritation of certain dusts leads to tuberculosis. A visit to clean, Alpine air relieves asthmatic and bronchitic people sensitive to dust. Storm van Leeuwen, of Leyden, has provided such air artificially by condensation of the moisture in a refrigerating machine and subsequent warming of the dry clean air. Sleeping in dust-free compartments, in sterilised clothes and ventilated with this air, many of these people are greatly relieved and can go about their work by day.

The amount of dust stirred up in houses from clothes, carpets, hangings, furniture, stuffing of pillows, dirt brought in by boots, particles of food, dandruff, is enormous, and the pollution in palaces as well as in slum tenements is very great compared with clean country or sea air. In damp soils and houses moulds are more abundant, and so are cases of asthma and bronchitis. To reduce house dust people must build and furnish their houses more like hospital wards, clean them by oily mops and vacuum cleaners, not stir up dust by brooms and shaking of mats, and have abundance of clean air passing through. In noisy, dusty streets fan ventilation is required combined with a water spray cleaner and a coil for moderately warming the air. One or more fan units, consisting of water spray, heating coil and fan, can be placed in each room, driving the air up towards the ceiling, whence it diffuses without draught. Such a system keeps down " droplet infection " as well as dust, and if the temperature be properly controlled refreshes the workers. It pays for itself in the diminished sickness and better work of the employees.

The breathing passages are kept clean by secretion of mucus and the action of the wonderful ciliated cells which ceaselessly drive the mucus to the back of the mouth, where it is swallowed. There are, too, phagocytes in the terminal air-sacs of the lungs which eat up dust particles and convey them away to the lymph tissue of the lungs, where they are stored, so that the lungs of a citizen become blackened with age and the lymphatic tissues gritty. There is one especially mischievous dust, viz. uncombined silica present in quartz, flint, sandstone, granite, etc. The inhalation of this dust by workers leads to degeneration of the lungs and a very high death rate from tuberculosis. The architect should bear this in mind in the choice of stone. The cutting and grinding of dangerous rock and stone should be done in the open or, if indoors, with dust extractors.

By spraying a culture of a harmless microbe into the air and exposing sterile culture plates at intervals of time and counting the colonies which grow out, it can be shown exactly how much an open window or a fan lessen infection. Dust counters are also used to study the effect of ventilation.

Not only is the air polluted in dwellings, but the light of the sun is cut off by buildings, clothes, glass, dust, and smoke. The economic loss due to smoke pollution is enormous—waste of fuel, with waste of human energy in moving fuel and ashes, destruction of stone and metal work, of house decorations and clothes, waste of human energy in washing and cleaning and redecoration, waste in the use of artificial light, waste of time of workers in travelling and of transport of goods by smoke fogs. The green food, too, is killed by acid smoke fumes, and this food, either directly or in the milk and butter of cows fed on it, is the great source of vitamins essential for growth and resistance to disease.

By living an indoor life in warm, stagnant atmospheres when at work, play, and asleep, the heat production of the body is reduced to a low level and the fire of life damped down. The respiration is shallow, the circulation of the blood slow, the abdominal organs not naturally massaged as they should be by deep breathing and active muscular movement. Little food is then required for combustion, appetite lessens, or too much is eaten, and wrong kinds of fermentation and indigestion and constipation result. Exposure to cold air out-of-doors may double the heat production and

oxidation of food in the resting man, and hard exercise put it up five and even ten times. Hence the great improvement in health and vigour of clerks, shopmen, and factory hands when they were enlisted and trained for the War. It is most important to put up the body heat production by open-air exercise and to tone up the whole sympathetic nervous system which controls the viscera by adequate exposure to cold. Those essential glands of internal secretion, the thyroid and the adrenals, are made active by such exposure.

I have designed the kata-thermometer for measuring the cooling power of the air on a surface at approximately skin temperature. It does not show directly the cooling power of the air exerted on the human body, for the bulb is of small size with a large surface comparable to the end joint of the thumb, while the human body is large with proportionately small surface and clothed. The kata-thermometer therefore loses heat much more rapidly than the body. I have made, empirically, standards of cooling power under ideal conditions. The ordinary dry-bulb thermometer gives the average temperature of the environment, a table fan does not vary its reading, but the fan powerfully cools the body, and so too the kata-thermometer, which consists of a large bulbed alcohol thermometer of standard shape and size graduated from 100° to 95° F. It is warmed in hot water till the meniscus rises above 100° F., then dried and suspended, and the rate of cooling from 100° to 95° F. taken with a stop-watch. There is a factor determined for each instrument by means of which the readings are expressed in millicalories per sq. cm. per sec. Wind has a great effect on the rate of cooling. For a tropical heat the bulb of the kata-thermometer is covered with a silk-net glove which evaporates water, just as the skin evaporates sweat, during cooling, and readings of this wet kata-thermometer taken. Formulæ and nomographs have been worked out from observations in wind tunnels at different temperatures, humidity, and velocity of air movement, by means of which the kata-thermometer can be used as a very sensitive anemometer, showing not only unidirectional currents, but any air movement which affects the skin. A dry bulb kata-thermometer graduated from 130°-125° F. has recently been made for use in hot places.

An index of atmospheric conditions, which includes both dry and wet bulb temperatures as well as air velocity, has been determined in the U.S.A. by Houghten, Yaglou, and others, by the comfort feelings of subjects who passed from one room to another. In one room there was established saturated air at a given temperature, in the other some combination of temperature and humidity, or these plus air movement, which afforded sensations equal to those felt in the first room. In one series of observations subjects are resting and clothed, in another stripped to the waist, in another working, and so on. Charts have been constructed from which any combination of wet and dry bulb temperature up to 110° F., and of air velocity up to 700 ft. per minute, can be transmuted into terms of effective temperature.* The effective temperature was found to depend chiefly on the dry bulb when that was low ; as the temperature rises the influence of the wet bulb becomes more marked. Thus still air at 96·9 dry bulb and 80·0 wet bulb produced the same feelings as air at 85° saturated with moisture. The American observers have claimed that the standards of kata-cooling power are not as good as the scale of effective temperature for indicating comfort. Observations made in a wind tunnel under varying conditions by my colleagues Argyll Campbell and Angus, on the loss of sweat, pulse rate, and cheek temperature have, however, shown that the kata-thermometer is as good a guide as effective temperature. The tunnel has a moving band for subjects to run on, also a bicycle ergometer, and can be heated, humidified, and ventilated at known rates by a fan.

Under ordinary conditions some 45 per cent. of the body heat is lost by radiation, 30 per cent. by convection, and 22 per cent. by evaporation, the lung losing about half or more of this. The skin evaporation is then an insignificant means of loss when a room is at 60°-70° F., and variation of humidity of the air having then little or no effect on comfort. It is found that some 62°–66° F. is required for comfort when doing sedentary work in an ordinary room, and the clothed surface then has a temperature of about 75° F.

Relative humidity is not directly correlated with body heat loss by evaporation, because the body warms up the layer of air in contact with it and saturates it at skin and lung temperatures. The

* Heat and Moisture Loss from the Human Body and its Relation to Air Conditioning Problems. By Houghton and others. *Journal of the American Society of Heating and Ventilating Engineers*. 1929.

important factor is the physiological saturation deficit—that is, the difference between the amount of water held in the air (1) at room temperature (2) when saturated at skin and lung temperatures. Sweating only comes actively into play when cooling by convection, and radiation does not suffice to keep the body temperature normal. In tropical climates, when the dry bulb approximates to or is above body temperature, the capacity of the air to take up moisture when saturated at skin temperature, air movement and a sufficient exposure of naked skin are the factors which make the conditions possible. Saturated air at body temperature is impossible to endure for more than a short period, for rise of body temperature leads eventually to heat stroke. The wet kata-thermometer reading indicates the conditions in the tropics or in hot workplaces. A man can work for a time in hot, moist air until his body becomes heated up and his pulse rapid. The pulse frequency is a good warning sign. Then he must cool off. Heat stroke occurs in hot, dry atmospheres when the sweat glands fail to act through illness, but can be very easily warded off by a wet wrap and a fan, i.e. by artificial sweating. The body is automatically kept at body temperature not only by regulation of the effective insulating value of the skin brought about by changes in the cutaneous circulation and sweating, but also by changes in heat production. Within certain limits the latter, however, remains constant; it is increased by that degree of cooling power (dry kata of 14 and over) which occurs out-of-doors when the wind feels cold.

When at rest a man breathes in about 15 c. ft. of air per hour and breathes out this air saturated at 93° F. The amount of heat so lost varies with the condition of the air breathed. If air is breathed in at 65° F. and 50 per cent. saturated, the loss would be about 40 B.Th.U. per hour, and in the case of perfectly dry air over 50. Hard exercise may increase the air breathed five times or so and thus greatly increase this heat loss from the lungs, the amount of water evaporated, and consequently the flow of blood lymph and secretion through the respiratory membrane. Exercise taken in a cold, dry atmosphere, as in the Alps, is then favourable to the cleansing and health of the membrane.

Movement of air and removal of clothes are the obvious remedies for warm conditions; the construction and ventilation of buildings should be such that hot conditions do not arise, and then greater efficiency, better health, and content follow. Hot processes can be screened and ventilated so that workers are kept comfortable. In South African gold mines it was observed that miners did 50 per cent. less work in certain hot galleries than in places where the kata-thermometer reading was brought up to the standard figure. In other mines more than one-third of the efficiency has been found to be lost in hot places. Ventilation should be arranged so as to give cool heads and warm feet. If the feet are on a draughty, cold floor and the head immersed in heated, stagnant air the mucous membrane of the nose becomes swollen and congested and catarrh favoured. The House of Commons has this bad type of ventilation, air being driven up through slits in the floor, a method designed to give hot heads and cold feet. In 1914, as an experiment, by closing the floor inlets and bringing the air in at gallery level I secured the right conditions, but to this day this simple improvement has not been made.

Schools should be built to give plenty of open air, enough clothing used, and exercise and food given to produce body heat in place of shut up heated places which spread and provoke disease. In cities where open-air schools are impossible and window ventilation impracticable owing to noise and dust, fan ventilation with clean air must be made adequate. It used to be considered enough to change the air of a 1,000 c. ft. space once an hour, but to make for vigour and keep down infection in a crowded place, such as between decks in a warship with less than 200 c. ft. of space per man, the change is made every two minutes. A great deal of adjustment can be done by altering the clothing, and custom should not forbid but encourage workers to adapt their clothing to the atmospheric conditions of the workshop. There is a difference of no less than 20° F., other conditions being constant, between the temperature necessary for maintaining body temperature in equilibrium in the case of the naked and warmly clad. In schools, the difference in warmth of clothing worn and the difference in fatness and vigour between a teacher and the children should be kept in mind. A thinly-clad, lean teacher chilled by a journey feels cold in a room which is too warm for well-fed children, overclad by coddling parents, and who have run along to school. In centrally

heated buildings thermostatic heat control is very often out of order. It pays to keep a proper hourly control by a skilled employee, seeing how large may be the reduction of working efficiency and increase of morbidity due to overhot workplaces. By such a system as the Carrier, automatic electric control of temperature, humidity, and air movement can be kept up.

High temperatures are common in schools, offices, etc., in the U.S.A. Only 16 per cent. of a large number of schools observed had a temperature below 66°, 37 per cent. between 71° to 75°, and 17 per cent. over 75° F. The New York Commission on Ventilation found that children in plenum fan-ventilated rooms kept at 68·5° F. suffered much more from respiratory illness than children in cooler, window-ventilated rooms. The difference was ascribed, not to more crowding, greater humidity, or deficient air movement, but to overheating.

Dr. Vernon, from his observations, concludes that the temperature should be kept between 59° and 66·5° F., and a dry kata-thermometer cooling power of 7. The temperature should not fall below 55° or the cooling power rise above 8 or 9.

The open-air school-children are well fed, have a rest and sleep of one or two hours in the middle of the day, and work for only short periods of time, periods of physical exercise being interposed. Children at ordinary schools may be kept sitting for $1\frac{3}{4}$ hours without a break and then not go outside for exercise when the interval occurs. Given frequent intervals for exercise, sufficient food and rest, all children would benefit from open-air schools. Vernon rightly points out that the air in schools and factories must not be so cold that hands get numbed, or so warm as to cause indolence. There should be large windows on opposite sides of school-rooms which can be open to any extent desired, affording, according to Dr. Kerr, at least 20 to 30 sq. in. of opening per child. The upper two-thirds of each window should be swivel and the lower third hopper. Draught from sash windows can be avoided by putting deflectors in the lower part which direct the incoming air upwards, or by gauze screens. The air can be warmed on cold days by a hot-water radiator placed below each window. One side of a class-room can be formed of swing doors which fasten back in pairs and are glazed and fitted with hopper windows; outside these doors there can be a verandah, and the children can sit at their lessons then inside with only the windows open, or with doors and windows open, or in the verandah, or out in the open yard.

Mr. T. C. Angus multiplies the approximate free area in square feet of all openings in a factory shop by 1,000, and dividing the product by the cubic foot contents of the room obtains an index figure of square feet of opening per 1,000 cubic feet of space. He contrasted two departments of a rubber tyre factory, each containing steam curing pans as sources of heat, and in each similar work was done. The one, the old shop, had small vents, and the opening figure was 2·32, and the dry kata reading went down to as low as 0° and the temperature up to 96·5° F. In the other, the new shop, there were abundant openings giving a figure of 8·66, and the lowest kata reading observed was 4. In the first shop, men became bathed in sweat, and were generally exhausted at the end of the day. In the other, conditions felt by the workers were only just on the warm side.

The following are suggested by Angus as suitable opening figures:—Offices 3, light manual work on cool processes, 5–6; ditto, with moderate heat, 6–7; heavy work with much heat, 9–11. Many more data of opening figures are required. The observation of air changes which naturally take place in buildings would make it possible to say what fans are required to supplement natural ventilation and maintain an equable, cool temperature. What must be aimed at is the ease, comfort and health of the workers, not the pumping in of an arbitrary quantity of air.

Comfort depends not merely on temperature, but on the way in which body heat is lost, whether by radiation, convection, or evaporation; radiation is most important, and depends on the surface temperature of the floor, walls and ceiling, and furniture. As pointed out by Mr. A. H. Barker, a little heat radiation on the skin has a great effect on the skin when cold, and approach to a block of ice a great cooling effect when hot.

Dr. Fishenden found that in a room of 2,000 c. ft. capacity, 105 sq. ft. of wall space (rather less than one of the smaller walls) heated to $93\frac{1}{2}$° F. emitted enough heat to maintain comfort with air at 60° F.—that is, with two changes of air per hour computed to entail an absorption of about 5,800 B.Th.U. For air at 50° F. the wall would have to be at 163° F. As a broad

approximation, 17 sq. ft. of wall surface, say 6 ft. by 3 ft. at 163° F., would emit 3,900 B.Th.U. per hour required to keep a room at 50° F., and give in position directly opposite its centre comfort to one individual sitting close up and at cost of 0·6 times that of keeping the whole room at 64° F. for his use alone. Nothing must be put in front of a radiator surface, for that part only is effective as a radiator which is visible. Therefore the ceiling is good as a radiating surface. Moreover, walls heated to 95° F. are, according to A. H. Barker, not comfortable to sit within a distance of 4 feet. With ceiling panels heated to 118° to 120° F. there is no more than 2° F. difference between the ceiling and the floor temperature in place of 10° F. usual with ordinary convected heat. A panel temperature of 105° to 108° F. suffices.

Glass is little transparent to low-temperature radiation, so the windows are comparable to walls in retaining warmth. Floor heating is uncomfortable if the feet are made too warm. By means of insulating foot-rests this difficulty should be overcome. Floor heating, like a hot water bottle, allows windows to be kept open by supplying warmth directly to the feet of the occupants. The low temperature which suffices for panel heating suggests that an extended metal surface with a hot pipe to heat it is better than the usual hot water radiator; the placing of such, says A. H. Barker, on inner walls and coating of the back with bright metallic paint would minimise loss in directions away from the room. Gas-rods are an ingenious method of panel heating.

In the case of anthracite stoves which offer a fairly extensive area of radiating surface and stand well out in the room an efficiency of about 50 per cent. is obtained, says Dr. Fishenden, twice that of the open fire. For a surface temperature of only 200° F., heating by radiation and convection are about equal; for higher temperatures the relative amount of radiation increases. The low radiation value of such stoves is due to low rate of combustion. The discomfort of dark heat radiation must be borne in mind. Suppose the surroundings are heated up to 75° F., then, to prevent the clothed surface of the body becoming warmer, loss by convection must be increased by reducing the temperature of the air, say, to 50°, or increasing the velocity of air movement, say, to 4 ft. per second, if the air be at 64°. If the temperature of the walls, etc., is low, then the air temperature would have to be higher. So, too, if there is any considerable air movement, convection loss increases and a higher temperature is required. Observation shows that cold walls and warm air produce discomfort, while moving air and radiant warmth, as out of doors, are most stimulating and best for health. Infra-red rays longer than 1μ-6μ from stoves and steam coils are absorbed very completely by water, and therefore do not penetrate through the surface layer of the skin. Warming this, the heat is thence conducted inwards. Very long infra-red rays, visible rays and longer ultra-violet rays penetrate in part to the blood in the skin and are absorbed therein. The red rays penetrate still deeper and are absorbed in part by the subcutaneous tissues, and warm these. The shorter ultra-violet rays have so little power of penetration that they in part are absorbed by the horny layer of the epidermis and only reach the myriads of living cells spread out just beneath this. These rays, scarcely any of which reach the most superficial blood capillaries, are the rays which particularly cause sunburn and form the antirachitic vitamin in the skin. The transformation of energy of the short infra-red, visible rays and longer ultra-violet rays in the blood is probably of no little importance. It is possible to heat the subcutaneous tissue 7° F. hotter by concentrated visible rays than by dark heat; that is, at the moment when tolerance is reached. The greater penetration of the short infra-red and visible rays excites flushing and sweating in the skin, and this makes the warmth of a fire comfortable and agreeable compared with the dry, burning sensation produced by dark heat rays. Radiation Limited, have just introduced "radiants" which afford a yellower light containing more visible and short infra-red rays and a more comfortable heat than dull red or high temperature dark heat sources.

It is economical in central heating to have the boiler under the house and not in an outhouse, so that the heat of the boiler contributes to the general warmth. A flued stove placed in the cellar or hall will do much to warm the whole of an ordinary house by convection. Advocates of such "pipeless" central heating are in error in saying that heating by convection is superior to heating by radiation. Such a method used just moderately to warm the house and supply hot water,

and together with occasional gas fires and a gas cooker, is economical. As the open fire loses convected heat by the flue, this should therefore be placed on an internal wall so that the flue may help to warm the upper part of the house. In the case of the open fire there are also losses due to incomplete combustion and to conduction through walls, so that the efficiency is not more than 20 to 25 per cent. of the total theoretical energy of combustion of the coal; good coke, says Dr. Fishenden, may give possibly 25 to 30 per cent. Efficient grates are now on the market for burning coke fitted with gas jets for starting the fire. Deeply recessed grates with high kerbs may give values lower than the above. Up-to-date flued gas fires give radiation equivalent to 50 per cent. or more of the energy of the gas used, with a total efficiency of perhaps 55 per cent. Electric heaters give 100 per cent. efficiency for the current used, the proportion of radiation rising to 70 per cent. or more according to type. According to Dr. Fishenden, on the basis of equal heat production out of so much coal in a room, gas fires are twice and electric heaters seven times as dear a coal fires; coke is a little cheaper. Taking the cost of coal as 1½d. to 2d. per therm, gas 8d. to 12d., electricity for heating 59d. (2d. per unit), the cost is in the ratio 1 : 5·3 : 31. For central heating and heating water no fuel can compete with coke in economy. The efficiency of a small boiler is about 50 per cent., and the convected heat is useful in warming the house. For discontinuous heating gas and electricity show to advantage. The portability also of an electric heater allows it to be used in close proximity to people.

The use of solid fuel involves much work in laying fires, carrying coal, cleaning grates, sweeping chimneys, cleaning up dirt, removing ashes. When energy can be had for less than 1d. a unit electricity is economic for intermittent heating. Intermittent heating by gas, together with use of coke for continuous heating and water heating, would mean a great saving in the annual use of coal and lessening of smoke pollution.

Gas and electric stoves score by quickly giving the full heating effect, but in cold weather the walls and furniture may get so cold that close proximity is required. "If," says Dr. Fishenden, "one can get within 5 to 10 feet of a coal fire burning 2 lb. of coal, a gas fire burning 30 c. ft., or an electric radiator taking 2 kilowatts per hour, one is comfortable with a room at 55° to 60° F. While the winter temperatures in this country rarely fall so low as to render air heating necessary, a radiant source such as a gas fire is most adaptable to a rapidly changing climate, and makes up for the mist. Where a few people can gather round a fire burning smokeless fuel this is best, as the air can be kept cool. In offices and factories either air or panel heating must be used. The heavy time lag is the trouble in all such systems. In the case of floor-heating by ducts similar to the old Roman hypocaust, the supply of hot air which is circulated by a fan can be cut off and cold air circulated when the weather changes, and the time lag thus lessened. Such floor-heating is of advantage for churches and cathedrals.

The large modern theatre does not require warming, but cooling, when once fully occupied. A thousand people have been calculated to give off about 400,000 B.Th.U., and about 6½ lb. of moisture per hour. A ventilation of about a million and a half cubic feet per hour may be required of air at 65° F. to prevent over-heating. In the super-cinema erected in place of the old Empire Music Hall in Leicester Square, with seating for 3,500, a very large volume of clean air is distributed per hour throughout the theatre. A refrigerating plant requiring a 250 h.p. motor is included. The cooled air is relatively dry, so that an invigorating atmosphere is maintained everywhere. The air is introduced at ceiling level and becomes warmed as it falls, passing out through exhausts in the floor. A Carrier air-conditioning plant is used which automatically controls the temperature and humidity. Most important in the case of factories where warm processes are carried on is the orientation and insulation from sun, and the whitening of roofs and skylights in summer

Heating, ventilation, lighting, lavatories and canteens are first essentials to workers, and the architect should design for these essentials, not work them into a design constructed for outside effect. Heating is always a difficult problem. Mr. A. H. Barker says that it is more or less guess-work to calculate how many B.Th.U. escape from a room kept at 60° F. to outside, say, at 32° F.; how many square feet of radiator surface is required at a given temperature to supply the quantity of heat required; what boiler and arrangement of pipes is required to keep all the

radiators at this given temperature. There is, he says, great discrepancy between calculations and results in practice. The reservoir of heat in walls, the conduction of heat through them, is incalculable, and the surface temperatures difficult to measure.

Unjustifiable are bye-laws which insist on a certain height of ceiling, for low rooms are more easily ventilated than high ; it is not cubic space, but air exchange, which matters.

Unjustifiable in these days, too, are bye-laws which compel the putting of lavatories and drain-pipes on outside walls. Such bye-laws lead to well-like openings in big buildings, and natural ventilation tends to drive air through the lavatories into the buildings. With steel-drawn pipes and exhaust ventilation lavatories can safely be put anywhere inside. Kitchens are best at the top of buildings, so that all smells escape with the ascending warm air ; where there are unflued gas flames, the ventilation must suffice to get rid of fumes. An open door or window is enough to prevent any risk from carbon monoxide.

Mr. P. J. Waldram has rightly condemned high buildings which shut out daylight, and so called " light wells." Every worker should have the right of sky light falling upon his work-table.

The prime motive of architects should be to design buildings which afford health and happiness to the inmates, not to secure approbation for the outside effect of the building.

As the best conditions for health can be secured by living in open-air shelters, what justification is there in country places for the enforcement of building bye-laws with insistence on concrete foundations, damp-courses, etc ? There is much to be said for light buildings such as Japanese houses which frequently can be renewed. Clean water and air, a proper method of disposal of sewage and refuse, are essential, and a garden of high value. Why, then, should a man who has housed his family on a plot of ground by his own efforts have his home demolished by order of a Council ? People secure good health in caravan dwellings and little bungalows, and while attacking the defacement of the natural beauty of the country, as at Peacehaven, by mean buildings, we must bear in mind that the most wonderful piece of architecture, the child's body, is made sound through a large measure of open-air life. While damp, dark habitations must be condemned, we must remember that a modern house which satisfies every bye-law, if left shut up and overheated, may do much harm to children confined within it, while a shed-like dwelling from which children escape to play in the open air may afford good health. A wise and elastic control by medical officers of health should take the place of obsolete bye-laws.

Discussion

Mr. E. STANLEY HALL, M.A., OXON., VICE-PRESIDENT, IN THE CHAIR.

Dr. RAYMOND UNWIN [*F.*], in proposing the vote of thanks to Dr. Hill, said : I think Dr. Hill has brought home to us how great and complex is the subject with which we are dealing : how we are really on the verge of quite a new outlook, not only with regard to ourselves, but with regard to heat and ventilation, which we thought fairly simple in the old days. He has shown us that there are many kinds of heat, and many kinds of rays, that these rays have different powers, and different abilities to penetrate and invigorate us. He has shown us that we were, perhaps, somewhat unduly concerned about the chemical purity of the air. The theory now seems to be that it is more important that the air should be moving than that it should be chemically pure. Dr. Hill will, I hope, forgive me if I say I am still just a little sceptical. I do not doubt anything he says : I have no doubt that movement is more important than chemical purity if he tells me so ; but I still have a lurking suspicion that we may find that purity itself has still some value. The fact is, that we are very complex creatures. He has reminded us that we are primarily animals ; that it is not very long since we were spending most of our time looking for a sheltered corner in which our unclothed bodies could have a little comfort. Our physical constitution is largely adapted to that way of being healthy. But, we also have minds much developed and curious about many things : their minds have led men on to a kind of intellectual and civilised life, which requires very complicated apparatus. And when speaking of the primitive person living in a shelter, and having spoiled the ground on which he had squatted, moving

on from place to place, we must realise that such life, which may be very suitable and very healthful to the bodily part of us, does not give much opportunity for our civilised or mental life. It is all very well for a man who has nothing but what he stands up in to live in a shelter, and when he has made that into a little quagmire, to move round the corner and do the same again : but we must be a little on our guard and not think we can carry on a civilised life on those lines. Dr. Leonard Hill has pointed out that it is possible to live healthily in cottages. He referred to some built at Papworth for people infected with tuberculosis, and that there has been no infection to the children. It gives me great pleasure to hear that from him, because these Papworth cottages are typical of a million cottages which have been built under the various housing schemes since the war ; and Dr. Leonard Hill gives me ground to hope that in those cottages also it may be possible to live a healthy, as well as a civilised, life.

It is not only true that we ourselves are animals, but we are made up of myriads of little fellows—I don't know whether I ought to call them animals or not. Scientists seem now to think that these little fellows themselves have rudiments of minds. Dr. Hill has pointed out that we may cause serious unemployment problems among these little fellows. If we are to keep healthy, it is not enough that we should have comfort such as we have been accustomed to ; we need comfort combined with adequate stimulation of the little cells of which we are made. A sluggish comfort produced by over-clothing our bodies, and over-warming our rooms, is producing an unemployment problem in all the little cells on the activity of which we depend for our life. We have to adapt our heating systems to these new facts. That is not altogether easy, and we do depend on scientists like Dr. Hill to explain to us, for instance, that radiant heat of a certain character is more stimulating to us, that it is better that we should wear less clothes, and that we should have radiant heat playing upon our bodies than it is that we should live in still, warm air. A considerable amount of research is needed to evolve systems of heating and ventilation which will satisfy the new needs. The Building Research Board have recently set up an Advisory Committee on heating and ventilation, to study these very problems. They have, at Watford, already a small model house with four rooms, in which experiments are being carried on. They have contrived what I call " our Robot," a creature consisting of various thermometers and recorders, this creature is recording day and night the different degrees of comfort and discomfort which he feels in the conditions of the room. While I think all this is of very great value, and we must work along these lines, we ought to be careful not to think every time we make a new discovery that we know the whole subject ; and not fly from one type of extreme to the other, because the problem is a very complicated one. There are, for instance, conditions which are inspiriting to us, and those which are depressing. We may make a very good Robot : he may record temperatures and such conditions very well ; but he may miss what is perhaps more important to us, the difference between something which is inspiriting, and something which is depressing. It is not always easy to reduce such conditions to terms of thermo-dynamics.

In regard to panel heating, I should like to ask Dr. Hill about the heat. I gathered that it is black heat, and I think he said he thought red heat was more stimulating than black heat. We are finding practical difficulties. The heat is liable to bring the plaster ceilings down, and there is the question whether a type of plaster can be contrived which will withstand the new conditions of having heat circulating behind it.

One small point : Dr. Hill opens his paper with this statement, " So far, the new building estates have not succeeded to any appreciable extent in emptying the slums." There I agree with him, and I think we must regret we have not yet succeeded, and continue to build until we do. But he says " Whatever has been done is nullified by the rate of migration into London." As I read the figures of the last two inter-census periods, there is no balance of migration into London ; on the contrary, there is a considerable balance of migration out of London ; that is to say, Greater London, *i.e.*, the police area has not, for the two decades previous to 1921 absorbed anything like its own natural increase of population, but, on balance, something like half a million people have migrated out in those two decades.

Mr. D. R. WILSON, C.B.E. (Secretary, Industrial Fatigue Research Board), seconding the vote of thanks, said : Although I am no technical expert, I have been in touch with Dr. Hill's work for nearly twenty years, and can therefore say with some first-hand knowledge that he is the chief pioneer in the development of modern theories of ventilation, and that our present more scientific way of regarding this subject is due very largely to him.

His paper covers such a wide field, that I feel I can only deal with a very few of the many interesting points raised. He starts with some notice of primitive habits of living, and goes on to show how the bad effects of ventilation were attributed first to the presence of the so-called poison CO_2, then to the presence of some mysterious organic poison, and it is now accepted that they are due to high temperatures and deficient air movement. Few, I think, will deny that primitive man, living as he did in a natural environment, must have been free from many of the infectious

disorders which now affect us, just as is the savage of to-day, and we can conceive that the Romans, together with their wonderful knowledge of structural engineering, may have had experience of the practical application of ventilation and heating problems; but how about the Middle Ages, when every principle of hygiene seems to have been completely disregarded? Or take the case of prisoners. In a room in a fortress at Aigues-Mortes thirty Huguenot prisoners are said to have been confined continuously for years. It had, I should say, about 600 square feet of floor-space, allowing 20 square feet per person. And yet one at least of these prisoners is known to have survived. Could that have happened under modern conditions? To what was this due? The relative absence in those days of our common infectious ailments, or to some fanatic determination to live against overpowering odds?

There is also the variation in practice in different countries as regards desirable environmental conditions. In America, for instance, as Dr. Hill points out, schools are usually kept at a much higher temperature than over here, and the same applies to ordinary dwelling-houses and hotels, while Americans, visiting England during one of our typical summers, have often complained of the impossibility of ever feeling comfortably warm. Is this due to racial differences, to custom, or to some variation in the climatic conditions, such as greater dryness of the air in the States?

Lastly, I would turn to the subject of industrial conditions. In recent years, owing very largely to the work of Dr. Vernon, suitable atmospheric conditions have been shown to have an important economic bearing. He has proved, for instance, not only that a marked seasonal effect exists in hot and heavy occupations (the production being less in summer than in winter, sometimes by as much as 30 per cent.), but also that this effect can be reduced and even neutralised by the provision of suitable ventilation. Similarly, Mr. Wyatt and Mr. Weston have shown in certain textile occupations, in which production is physically stimulated by moist conditions, that output begins to fall when the wet bulb temperature reaches a point previously indicated by physiologists to be the maximum desirable, and that this effect can only be due to the unfavourable physiological effects on the operative. Dr. Hill at the end of his paper rightly points out that the health and happiness of the worker should be the paramount consideration in design and equipment, but the economic question of production is also of great importance; indeed, all evidence goes to show that maximum efficiency on the part of the worker is contingent on maximum fitness.

Dr. H. M. VERNON: Of the numerous topics which Dr. Leonard Hill has dealt with this evening, the one he laid most stress on was that in houses and offices and other buildings there is not enough air movement; and one of the most striking instances he adduced as to the importance of plenty of air movement and its health giving effect was found in open-air schools, which are growing up in considerable numbers all over the country. These schools are specially for children suffering from some physical disability. Even in the coldest weather the children have little or no artificial means of warming, yet in spite of that, even in such weather as we have been having in the last few weeks, they thrive and put on weight, and seem able to keep more free from coughs and colds than children in the ordinary day schools which are artificially warmed. You might conclude from such a result that we ought all to live in these open-air conditions when at work. In order to find out how these children manage to survive and thrive under open-air conditions, Dr. Bedford and I have, in the last few weeks, made observations on the children in such schools, and also, for purposes of comparison, on children attending ordinary warmed schools. We used a comparatively simple test. We took the hand temperatures of the children with a delicate thermopile, going round every fifteen minutes throughout the school day. We found that if the hands got beyond a certain degree of coldness, the fingers became numb, and then the manual efficiency diminishes, for the children could not write properly, and they experienced such discomfort from the cold that the mental work suffered. In the last few days we have been at Nottingham, where the temperature was below freezing point. These children, mostly girls, were well wrapped up, wearing ulsters, gloves, etc. We found the temperature reduced their manual dexterity by about 10 per cent., but they could write fairly well, and do a fair amount of work. The reasons were that they were well wrapped up, and they had excellent meals provided—breakfast, dinner and tea—and they never sat down to work for more than half an hour at a time. Then they had physical exercises, then did another half-hour of work, and so on. It was rather exhausting for them, so after their dinner they lay down for an hour, well wrapped up, before starting their work in the afternoon. It was excellent for the debilitated children; they grew rapidly in weight, and they were well stimulated by the cold. Though health is the primary consideration, you have to consider also how they got on with their work under these conditions, and they could not have done more than half as much work as the children attending well-warmed schools. The children in the usual warmed school-rooms we found to be more sensitive to cold than were those I have just referred to, partly because they were not so well fed, nor so warmly clad. Moreover, they often sat for one or one and three-quarter hours at a time

at their lessons, and had not the opportunity to run about and keep warm. Therefore, if you expose children to more than the average amount of cold, you must be content to let them give up some of their work, and must give them extra opportunities of taking physical exercise. We concluded that if a full day's school work is to be performed, the temperature of the school should not be below about 55 deg. Fahr.

When you come to consider workers in factories, etc., you must remember that they have to sit for hours on end at their work, and so they need a higher temperature, namely, about 60° F., if they are to be at their fullest efficiency. We frequently found that the air movement in factories was deficient, and it is most desirable to have the air more freely moving, but I do not think it is possible to have both true open-air conditions, and the maximum efficiency; you must choose between the two. No doubt, in open-air schools you could improve efficiency by heating the floors, and, in some of the open-air schools we went to, the air movement was greatly reduced by having canvas blinds on the sides on which the wind was blowing.

One point Dr. Hill mentioned in his lecture was the *opening figures* which Angus adduced to show the openings in the rooms for ventilation. He calculated them in such a way that they depended on the volume of cubic air in the room. Supposing one had a room 10 feet in height, and if, with the same openings, one increased the height of the room to 20 feet, the ventilation would probably be rather better than before, and yet the opening figure would drop to half. Dr. Bedford and I thought it best to calculate the area of the opening in terms of the floor area, and did not take account of the height of the room.

Mr. A. H. BARKER, M.I.C.E.: Almost all the ills from which we suffer are due to living wrongly, in one way or another. People who have been accustomed to live in stagnant and unhealthy conditions come to regard these conditions as normal and comfortable. If we are to be shaken out of those ideas and to become accustomed to live in a more healthy environment, we can only do so by enduring, for a long time, perhaps, a considerable degree of discomfort until we get used to the new conditions; it is only after becoming accustomed to them that they can be appreciated. No conditions can be said to be satisfactory unless the person in doing his work is unconscious of them, that is to say, his attention must not be distracted from his work by the condition under which he does it.

It has always been my belief that health and comfort at the same time could best be obtained by delivering heat to rooms in a manner different from that which used to be universally accepted, namely, by the convection method of heating the air of a room by radiators and pipes. I happened on this idea in a curious way. I lived in a house 20 years ago in which there were two rooms side by side of the same size, but one, with a northerly aspect, was actually of colder construction than the other. Yet the colder room felt the warmer, though the thermometer showed the same temperature in both. I found it was because the kitchen flue passed up the wall of one room and kept the wall warm. As it did not directly warm the air much it was not recorded by the thermometer. That idea led me to patent the embedded panel system, which has since then obtained a considerable vogue in new buildings all over this country. The difficulty about that system in its original form is its inflexibility. If anything goes wrong, if pipes get stopped up, or corroded, or, if leakages arise, it is difficult to alter without a great deal of disturbance. One cannot imagine an embedded panel, or a pipe, which will last as long as the building. A formidable situation may arise when its period of usefulness comes to an end. For that reason I introduced the removable metal panels, now called "rayrads," which are now being extensively employed to produce the same effect. I think the problem which will face the architect in this country, and which will, perhaps, apply more to this country than to any other, owing to its peculiar climate, is to warm a building in such a way that the structure can be warmed without unduly warming the air. By most systems the air is warmed first. I believe that is the wrong way, we should warm the structure first; the temperature of the air must then be lower, on the average, than that of the walls. The ideal is that there should be cool air, the feeling of cold being suppressed, by radiation, from the warm structure.

One of the great lessons of this lecture to me is, that there is a pronounced difference in physiological effect between invisible radiation of different wave lengths; I have no direct knowledge of that. I have derived such knowledge of it as I possess from what Dr. Hill has taught, and I should like to know more about the penetrating power of different kinds of infra-red rays. It is a subject of the greatest possible importance. My view has always been that any low frequency or invisible infra-red rays would have the same effect, whatever their wave length, and I am afraid I am not even now convinced to the contrary. As a consequence of hearing this lecture, I shall make a more complete study of the subject than I have hitherto done.

Mr. PERCY J. WALDRAM [*L.*]: Dr. Hill's task to-night, which has been no light one, has been to place before practising architects the medical basis of a great revolution in the co-related subjects of heating and ventilation. Most of us acquired our knowledge of these subjects in what may be termed the bad old carbonic acid days. In order to expose the

old bogies of carbonic acid and toxic poisons from bodily emanations, Dr. Hill has had to review a vast advance in scientific and medical common sense which has been effected of late years. His subject matter, necessarily, covers a wide range, and if one is apt to feel, perhaps, a little breathless at the speed with which he hurries from skin reactions to Dr. Fishenden's economics, and, after a mere passing glance at panel heating, on to by-laws, and open air dwellings, we must remember that a single lecture cannot be a text book.

Every section of this paper might profitably be enlarged upon. Very wisely Dr. Hill has given merely the medico-physical outlines, leaving us, as practical designers, to work out their application, with due regard to the factors and possibilities of each particular case. An entire evening might be spent, for example, upon the possibilities of that wonderful instrument, the kata-thermometer.

Only those who have had to ascertain the carbon dioxide content of the air of, say, a crowded factory or theatre with the old apparatus can fully appreciate an instrument so simple, so small, and yet so accurate and so certain, direct and immediately informative in its results. The saving in labour and the gain in certainty which it has effected in the design of combined ventilation and heating systems, fans, air ducts, calorifiers, etc., is truly enormous, and what is far more important, it enables the architect to specify results with certainty, and to test those results rapidly. Full descriptions of the kata-thermometer will be found in the Reports on Ventilation of a medical Research Council published by H.M. Stationery Office.

The paper shows us that the human body is, after all, really the most efficient heating and ventilating apparatus ; complete with most perfect automatic adjusting mechanism, generating heat when exposed to cold, cooling by evaporation when exposed to heat. The great lesson to us as architects is surely that we should, as far as is practicable in our buildings, permit human bodies to work under those natural conditions which have determined their development through countless ages ; before modern civilisation tried to provide substitutes from those natural reactions upon which the health of the body absolutely depend.

We may be permitted to welcome particularly Dr. Hill's valuable data as to the superiority of light radiant heat over dark radiation from the more economical closed stove. The open fire, is, of course, highly wasteful ; but the wisdom of architects in retaining provision for it is now amply justified. Not only is its radiant cheerfulness of great medical value, but in spite of all the economic advantages of closed stoves, gas and electricity, probably the economic domestic heating agent of the future will be largely the open fire of coke or coalite from which the invaluable gas and oils has been distilled by low temperature carbonisation and distillation. As architects we are often blamed for love of tradition. But in this matter, as in all things, there is much that we can learn from the past. Quite the most efficient fireplace I ever saw was in a very old inn at Eltham, now, alas, improved out of existence. It consisted of a cage of iron projecting over a generous and well curbed hearth and covered with a wide, projecting hood.

Further back in the ages we find the Roman hypocast. Surely this was a heating apparatus, simple and economical, and almost medically perfect for one storey buildings on the clay or damp soils of this country : well worthy, one would think, of being revived by architects even after 2,000 years of disuse.

The most important parts of Dr. Hill's paper are his criticisms of Bye-Laws. One hopes that he will agree with the suggestion that we must be careful not to advocate remedies which might well be worse than the diseases. Dr. Hill rightly condemns bye-laws which prevent or render difficult temporary semi open-air dwellings which are now known to be healthy. That, however, is no reason why we should cease to specify adequate foundations, and particularly adequate damp courses in brick and masonry houses. On the Damp Houses Committee of this Institute, the report of which was completed last week after several months of work, we have had more than abundant evidence of the ravages of heart disease traceable, so the doctors inform us, to the effects of rheumatism and rheumatic fever caused by houses inadequately protected from damp.

I am in a position to concur with Dr. Hill's advocacy of buildings of a temporary nature. For a period of about two years some time after the War I was in charge, on behalf of a Government Department, of the maintenance of several thousands of temporary dwellings, hurriedly constructed during the war of timber, or rather of a material which could not rightly be called anything else. These I was able to compare simultaneously with the maintenance costs of some 1,800 up-to-date Garden Suburb dwellings of brick and masonry. The cost of maintenance of the wooden buildings, including painting and a considerable amount of roadmaking, was only a small fraction of the cost of maintaining the brick and masonry structures. But what was far more important was that cases of tuberculosis, rheumatism, illness traceable to damp and dry rot, etc., in the more substantial houses, were entirely absent from the timber houses. Also, a little earlier, I had to design temporary accommodation for a large number of workmen and foremen, resident engineers, etc., on the wet, water-logged soil of North-East Lincolnshire. In this situation timber houses and hutments raised some 18 inches or 2 feet above the soil were absolutely dry, far warmer in winter and cooler in summer than brick houses in the adjoining village.

Dr. Hill's advocacy of open air schools suggests inevitably partially open air dwellings in the form of a balcony or verandah living room on the first floor, such as is found on the sunny side of practically every chalet in Switzerland ; and, I am informed, also common in America. Housekeepers would undoubtedly welcome, at least throughout the summer months, such a space approached by outside steps, provided that the kitchen or scullery kitchen could adjoin, no dust or dirt being brought into the house by children. The difficulty would, of course, be to render such a room equally habitable in inclement weather. One's experience with timber constructions would suggest that this difficulty could probably be overcome by the use of casements and double wood shutters sliding into the spaces between windows in order to secure in sunny weather a room which, if not entirely open, could at least be opened to the air to a far greater extent than is now customary. Also in factories it would appear that the use of large iron casements, sliding vertically on ball-bearing runners, something after the manner of the Yorkshire sash, would probably give us workshops which would be far healthier than is afforded by the customary provision of large fixed iron windows with a wholly inadequate opening light at the top.

Dr. Hill recommends that bye-laws should permit artificially ventilated lavatories in the interior of large blocks of town buildings on the American principle, as tending to eliminate inadequate wells. The dimensions of wells, quite incorrectly called " light wells," in large buildings, permissible under the London Building Act, are ridiculously inadequate. It may not generally be recognised that the reason for this is that under the Public Health Act the Ministry of Health are not empowered to insist upon any provision for light, but only for ventilation. Amendment of the Public Health Act in this direction, and possibly in other directions, is long overdue. I would venture to suggest that the provision of mechanically ventilated accommodation in large town hotels and office blocks would be, on the whole, a step in the wrong direction. Legislative power is needed not to reduce but to increase light wells. It is difficult to appreciate, and impossible to exaggerate, the enormous injury to the health and well-being of town workers which is caused by insufficient light wells. Almost invariably these are cut down to the lowest limits legally permissible in order to secure the maximum amount of floor space. Suites of offices, having front rooms on some bold sunny façade, will let readily, in spite of the fact that the back rooms of such suites will, as long as the building remains, be occupied by subordinates, typists, and others, who may have to work under artificial light all day and every day, and who live in the more crowded suburbs and tenements.

It is often urged that these conditions are inevitable, any improvement being economically impossible ; that light wells sufficiently large to be effective destroy so much lettable floor area that they can only be afforded in luxury buildings, such as the head offices of large banks or insurance companies or public buildings, and that if adequate light wells were compulsory, capital would be diverted from building ventures, and rebuilding would cease. As against this helpless and hopeless view it may be urged that wells, planned with a view to their maximum efficiency as light wells, will do much to reduce the large gap between the maximum rental return to the building venturer and the minimum of light and air to occupants, and even to bridge that gap completely.

[Mr. Waldram then exhibited lantern slides showing alternative plans for a large block of City offices on a typical site. Quoting from an analysis of the results in lettable " carpet area " adequately and inadequately lit, he claimed that by intelligent design of light wells it should be possible to obtain practically the same rental value from a building reasonably well lit all over as from a building in which the light wells were cut down to the Building Act minimum.]

Mr. FRANCIS HOOPER [*F.*] : What Dr. Hill told us is being done in many parts of the country for children is of immense interest ; for those children are to be our successors. We trust they will be able to worship in some of those places which to-day are neglected because they are so fearfully insanitary. Many excuse themselves from entering such places because they find them draughty, or they come out of them with a headache. One may have draughts without there being a crevice admitting the external air, merely from changes of temperature in an enclosed space. There are cases where defective ventilation is rightly attributed to the building, when it is insufficiently protected from the external cold, either through excessively large windows, or an inefficient roof.

Mr. ARTHUR GLOVER : In regard to the Panel System, the fear has been expressed that it may be necessary to invent a new plaster, to stand the strain caused by the heat of the pipes, which is usually about 120 deg. Fahr. But, as is proved in bronze casting (the moulds of which are composed of sand and plaster), plaster is capable of standing many times that heat without harm.

With reference to open-air schools it is unfair to make tests during the recent abnormal conditions. With our climate it is possible to be out of doors most of the year in comparative comfort. In London there are at least twelve open-air schools for delicate children, and the results more than justify their existence. Dr. Rollier's world-famous school in the sun at Leysin is another example of what can be achieved by fresh air and sunlight.

The CHAIRMAN : I feel that Dr. Hill's paper

might well have been headed "Ventilating and Cooling," as, from what I can gather, the most important thing is to heat the person and the room to the minimum and not the maximum amount. And that was certainly the experience of the War. Some people lived much of their time in billets—empty houses—during the cold weather, when heating was reduced to the minimum, and it was extraordinary how fit they were in those places.

The second important point which has been brought out is that about the movement of air, and we are comforted by the thought that air through crevices and doors and windows keeps us going. Mr. Girdlestone, of the Wingfield Hospital, Oxford, makes a very important point of movement of the air; it is, in his view, as important as sunlight.

With regard to ceiling heating, I would like to ask Dr. Hill a question. I have had an idea that the secret of the floor being as warm as the upper part of the room was that it was the ceiling underneath which was doing it!

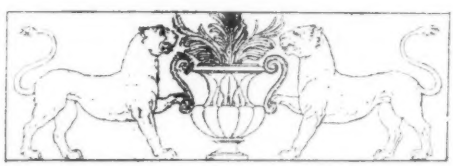
With regard to warm heads and cold feet, the natives in India on a very cold morning never dream of wrapping up the feet; they put all their clothing round their head. There may be something in that; I shall be glad to know what it is. It may be that the head requires more warming than the feet.

The Chairman then put the vote of thanks which was accorded by acclamation.

Dr. LEONARD HILL (in reply): I would like to say that, of course, we have got to do sedentary work indoors; that is civilised life. But I maintain we have got to get conditions as good as we can indoors. And when I said chemical impurity did not matter from the point of view of oxygen and carbonic acid, I insisted as strongly as possible that purity from the microbe and dust point of view was of the greatest importance. Therefore we come back to the point that we have got to have as pure air as we can get, and we can only get it by abundance of ventilation and clean air going through the room. We must put plenty of air through by open windows, or by driving washed air through, and slightly warming it. Sometimes it requires to be cooled, such as in theatres. If we steadily educate and discipline ourselves to take some measure of open-air exercise we shall inevitably feel the benefit. I have mentioned that the day boys at schools get less infectious disease than the boarders who did not leave the school precincts. This was shown by Surgeon-Commander Dudley at the Greenwich School of the Royal Navy.

I have had to live the open-air life and discipline myself. I was once at a dining table at Montana sanatorium, and there were four men dining, and each of them said they never knew what it was to enjoy life until they got tuberculosis. They cured themselves by the open-air treatment. It was a striking statement.

Mr. Waldram talked of rheumatic fever. I read in THE JOURNAL of the Institute the debate on rheumatic fever a year ago, in which certain medical authorities spoke. But I was not in the least convinced. At the National Institute of Medical Research the medical statisticians have reported on the matter, and we have nothing but clinician's statements, unsupported by any real statistical evidence that rheumatic fever is closely associated with damp. No real evidence on that could be collected. But we do know that rheumatism is associated with poverty: it is one of the low forms of infection which is associated with the worst kind of slum tenements. During the War there was practically no rheumatic fever among the troops, who were exposed to the damp and cold of the trenches; so I do not feel very guilty in supporting the open-air shelter. The Medical Officer of a big Yorkshire city told me his Council ordered him to turn out from allotment sheds families who were living there because of the shortage of houses. He went with that intention, but found the children so healthy, that he went back to the Council and said he could not do it, even though they were contravening the bye-laws. I wish it could be made possible for bye-laws to be relaxed at the wisdom of medical officers. We must not deprive people from living the more or less open life in bungalows and such like if they choose to do so.



The Walled City of Kano

BY MAJOR PHILIP N. LOGAN, O.B.E., A.R.I.B.A.

FIG. 1.—THE CITY OF KANO

THE City of Kano is situated 705 miles north of Lagos, and approximately 50 miles south of the Sahara Desert. Although the history of the origin of the city is purely of an oral nature, it may be accepted that it was first established about 1000 A.D. The founder is said to be one, Kano, a blacksmith, who, searching for ironstone, settled near the Dalla Hill, which is still a prominent feature in the city. At this date the inhabitants were purely aborigines, but about the middle of the fourteenth century the country was invaded by the Singhars, a tribe of Arabic origin, who commenced the work of building the city in earnest. It would appear that these emigrants gradually crossed the Sahara Desert from the north-east, for it is a point of considerable interest, that at both Gao, Tenne and Timbuctu a very similar type of architecture is found, and this would bear out the argument that the emigration came originally from wandering Arab tribes who had crossed the Red Sea and gradually worked across the desert during the fourteenth century.

The city, which is roughly $4\frac{1}{2}$ miles across at its widest point, and contains some 50,000 inhabitants, is entirely surrounded by a great earth wall, $14\frac{1}{2}$ miles in circumference (Fig. 1). The history of the city is one of continual warfare, and this wall was in consequence an essential to its protection. The wall, which is 100 feet thick at the base, and 40 feet high, is built in two great terraces, leading up to a fighting platform protected by a continuous battlement. The first terrace was used as a path for horsemen to gallop round and reinforce threatened points. At intervals are protected look-outs for sentries. Portions of the wall are now unfortunately partially ruined. Access to the city is only obtainable by means of 13 narrow gateways, fitted with heavy iron-plated doors, which are still in use, and are closed nightly at sunset. Each gateway is roofed, and ingeniously devised in order that the defenders of the city might use every possible means to repel an attack.

The city, including the walls and roofs of the houses, is entirely built of mud. At first sight such a primitive material does not seem to promise an interesting type of architecture, but in actual fact the contrary is the case, both from a constructional and decorative point of view. The use of mud as a building material was, as is usual, greatly influenced by local conditions. (i) At the period that the city was first built, the inhabitants did not possess the necessary tools to quarry and work the local stone, which is of a peculiarly hard nature. (ii) The local earth is of a very suitable nature for building, being, when mixed with water, of a strong plastic nature, which matures to a comparatively hard material when exposed to the sun. (iii) The greatest factor towards the choice of mud as a building material was, however, the peculiarly dry local climate, the average rainfall being between 33 and 34 inches per annum. The fact that mud has been employed continuously as a building material for at least a thousand years, and is still universally used, indicates its satisfactory nature for the locality.

The history of the improvements in construction from the earliest buildings down to the present date is one of great interest. In the very earliest houses, very few of which remain, the walls are made of great thickness, without reinforcement of any kind, and with little batter. The roof was supported by columns, 4 to 5 feet diameter, spaced, at close intervals, and supporting large timbers covered with poles, the whole roof being covered with mud about a foot thick. The usual house was only about 14 feet by 10 feet and consisted of only one chamber, without windows, and possessing only one entrance (Fig. 2). Oral history states this type of house to have been built before the arrival of

the Hausa people, which would place its date as, at the latest, 1350 A.D. After a careful study of some hundreds of the oldest houses in Kano there appears no reason to doubt that this early type of house is of approximately the date indicated.

The transition from this primitive architecture was arrived at by the introduction of arches to support a domed roof, and a fine specimen of this period is to be found in the half-ruined house of the Sariki Dawakis (Chief of Dawaki). This consists of a chamber 12 feet square. From the centre and ground level of each wall springs an arch, the four arches meeting at the centre, and being supported by one pillar. These arches were reinforced by a series of wooden poles bent and tied together, and connected at the crown of the arches in a most ingenious manner, which will be detailed later. It is of interest in this period to note that the reinforcement was of wooden sticks, and not of the Deleb palm tree, which was extensively used at a later date, and up to the present day. Evidently the builders were doubtful of the safety of the arches alone, and still preserved a central pillar, as an additional factor of safety (Fig. 3).

The Emir of Kano, who gave me much valuable information, informed me that there was a transitional period from the flat roof to the domed, the construction of which consisted of building the walls of the house first, and filling them with loose earth, which was raised to a rough dome above the walls. The walls were then continued over this rough centre in wet mud, and beaten hard to form a dome, the supporting earth below being removed when the dome had set hard. Although I was unable to find any specimen of this type, which would be probably eleventh or twelfth century, there seems no reason to doubt this method, as curiously enough, even at the present day, the use of the centre is unknown, and rooms 25 to 30 feet square are vaulted in reinforced mud without the use of any centering or struts.

The next period appears to date from the height of the city's prosperity (1463–1499). The central pillar disappears, and the supporting arches are doubled and are at about 4 feet centres. Thus eight arches spring from the floor and intersect at the cap of the dome, forming a square. The springing of the dome itself, which is a segmental one inside and circular outside, is at a level of about 10 feet to 15 feet above the floor, thus allowing the arches to have a considerable haunch. This lessening of the wall thickness necessitated the introduction of the buttress, a feature which became more and more prominent as the span of the arch increased. The general appearance of a chamber of this design is distinctively impressive. The soffits of the arches and architraves of doors and windows are elaborately decorated and coloured, and many of the decorations are almost Gothic in character, and, considering the material used, of great delicacy; in some cases each rib of the panels, although only an inch wide, is moulded. Even up to the present date

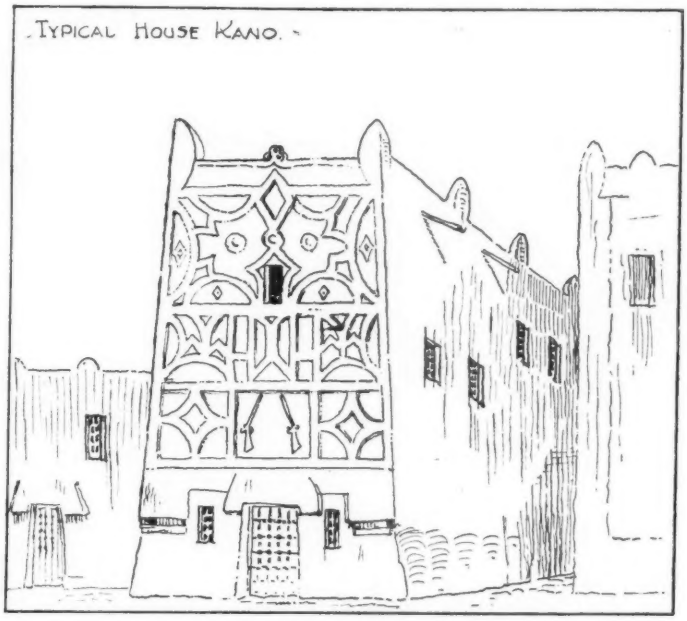


FIG. 2.—TYPICAL HOUSE, KANO

the masons, or mud workers, use nothing but their fingers for working the decorations, which in modern houses are of a most elaborate nature.

The most important factor denoting this period, however, was the discovery of the utility of the deleb palm trunk as a reinforcement; not only is this a more pliable material than ordinary wood, but it is proof against termites, whose depredations on ordinary wood soon affected the safety of the building. So popular has become the use of these trees that none is left within thirty miles of Kano, and the cost has in consequence become very high.

The final period, which corresponds almost exactly to the present-day design, was reached by allowing the supporting arches to spring from the walls at about 6 feet from the floor, thus providing additional floor space.

The quality of the local earth naturally lends itself to the erection of mud buildings, and its preparation is of some interest. After the earth has been broken up and mixed with water and specially dried grass it is well puddled, usually by foot, and is then left. Every week for at least a month it is again watered and repuddled and again left to mature. Whilst the actual action which

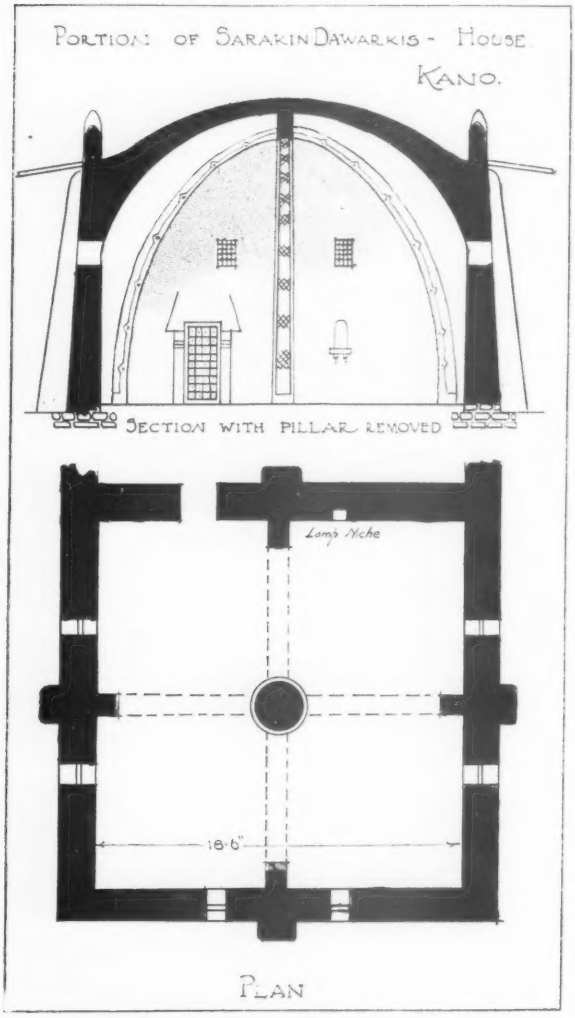


FIG. 3.—HOUSE OF THE SARAKIN DAWARKIS

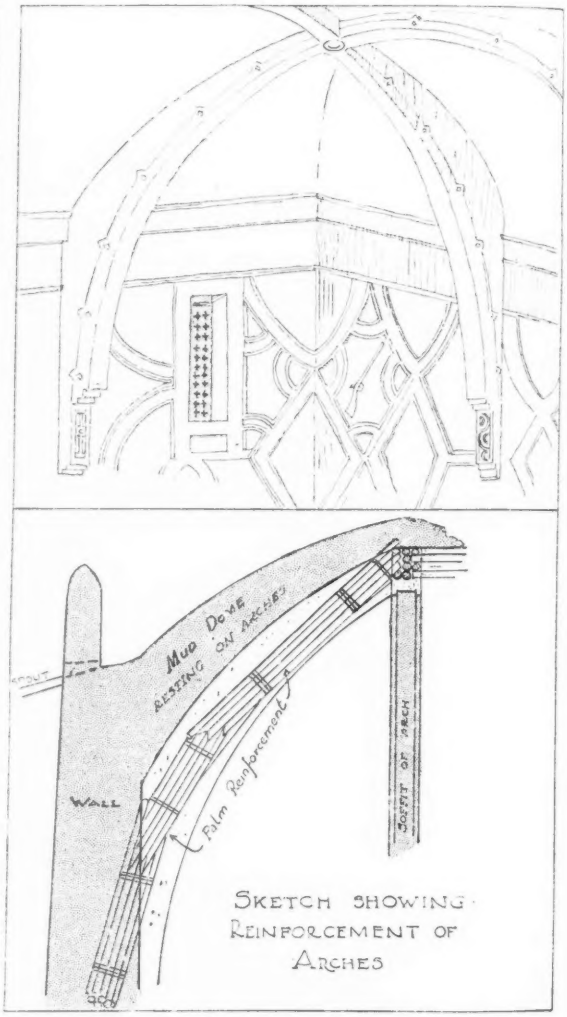


FIG. 4.—INTERIOR OF HOUSE, KANO

takes place during this period seems to be unknown, the process is considered an absolute essential before good building material is obtained, and is termed " rotting " the mud. The foundations, consisting of large pieces of " laterite " (ironstone) are laid upon the bottom of the foundation trench, and usually brought up to ground level.

The mud has in the meantime been formed into " tubali," an egg-shaped brick about 6 inches long and 4 inches at its widest diameter. These, having been dried in the sun, form the core of the wall, and are built up embedded in mud. The final coat inside and out is made from a special earth of very fine texture, which enables the builders to utilise fine and detailed decoration without the mud cracking. On the best type of buildings the final coat on the outside is finished with mud which has been mixed with the residue of the dye-pits, giving a dark maroon coloured finish of great hardness.

The construction of the arches which support the domes is of extraordinary interest, and displays considerable ingenuity. The wall having been raised to such height as the builder considers the springing of the arch should commence from, a number of lengths of split deleb palm, usually about 3 inches diameter and slightly bent, are inserted in the wall and firmly bound together ; to these a further number of pieces are lashed, the joints being most carefully interlocked (Fig. 4). This process is continued until, in the case of a four-arched building, a distance of about 4 feet to 6 feet is left, and an open square is then formed by a number of additional pieces, which interlock into the ends of the four cantilever arches and form a species of keystone. So important is this work considered that, in any building of importance, the Sariki Gida, or head of the city builders' guild, usually does this work himself. The spaces between these ribs or arches are then entirely covered with further pieces of palm-tree, sloping to the shape of soffit of the dome. The central square is filled in with short lengths of palm-tree placed on the diagonal and meeting in the centre. The workmanship of the whole of this construction is extraordinarily good, the pieces being formed into beams lashed together to form a solid and even surfaced whole. Mud is then applied to the inside and decorated, whilst the outside is covered with from 6 inches to a foot of mud, which is finished in " makuba," a native cement composed of ground lotus seeds, which has considerable waterproofing qualities (Figs. 5 and 6).

In the case of flat roofs at least 12 inches of mud is placed on the top of the rafters, with a very sharp fall to the parapet, which latter feature is a positive characteristic of every building. The water is conveyed from the roofs by means of troughs formed out of hollowed palms, standing out 4 feet from the walls in order that the water may be thrown well clear of the walls ; this is clearly shown in Fig. 2. The battered wall is a characteristic of almost every building, giving a fort-like appearance to the larger houses, in particular the mosque in the Emir's palace, which rises to a height of 66 feet above the ground.

The decoration and detail in most cases consist of slightly raised bands, fluted by means of the builder's fingers. In view of the fact that the builders even now work for the most part without rule, level, plumb, or plans, it is extraordinary how symmetry was preserved in forming the various patterns, this applying especially to the older works. Indeed, the modern plaster-work cannot be compared, either in execution or fineness of design, with that of the fourteenth century. A characteristic and almost universal treatment of doorways is the superimposed apron hood (Figs. 2 and 3), somewhat similar to the apron used under windows in modern European architecture.

Another absolutely universal ornament is the battlemented parapet. This either consists of a series of pointed battlements, or more frequently, as will be seen by the illustrations, a two-sided battlement on each corner with single-sided ones spaced along the walls. No doubt they originated from the conditions, which only ceased thirty years ago, when warfare between various Emirates was

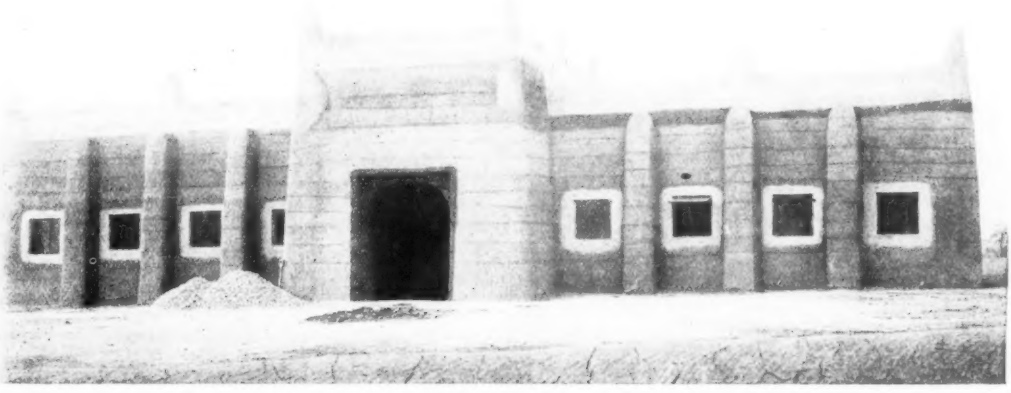


FIG. 5.—A MODERN SCHOOL, KANO

continually waged. A further interesting series of decoration is the treatment of outside walls which, by the use of the fingers, are covered with a series of patterns, favourite ones being the imitation of a palm leaf and a superimposed series of fans.

The various doors of the gates of the city wall are of great interest. They are composed of a wooden frame covered with small iron plates of native manufacture, each being riveted one over another. The doors are pierced by hundreds of bullet-holes, showing the numerous conflicts that have taken place even in modern times. The locks of these doors, which are many hundreds of years old, are of some interest, being of the crudest manufacture and design. The square lock-bar passes through a hole about $\frac{3}{4}$ inch square, which is pierced in the top of a cylindrical box of iron, the bottom of which is open, the lock-bar having two pieces of spring attached each side similar to an arrow-head. These are pressed against the lock-bar as it passes through the square hole of the cylindrical lock, and on entering the cylinder fly apart, preventing the lock-bar being withdrawn.

Although it is not claimed that Kano is unique (it is surrounded for some hundreds of miles by similar but smaller walled cities), it is certainly an example of an architecture of great interest, in that it has developed a high degree of picturesqueness in design and soundness in construction whilst preserving building materials of the most primitive nature.

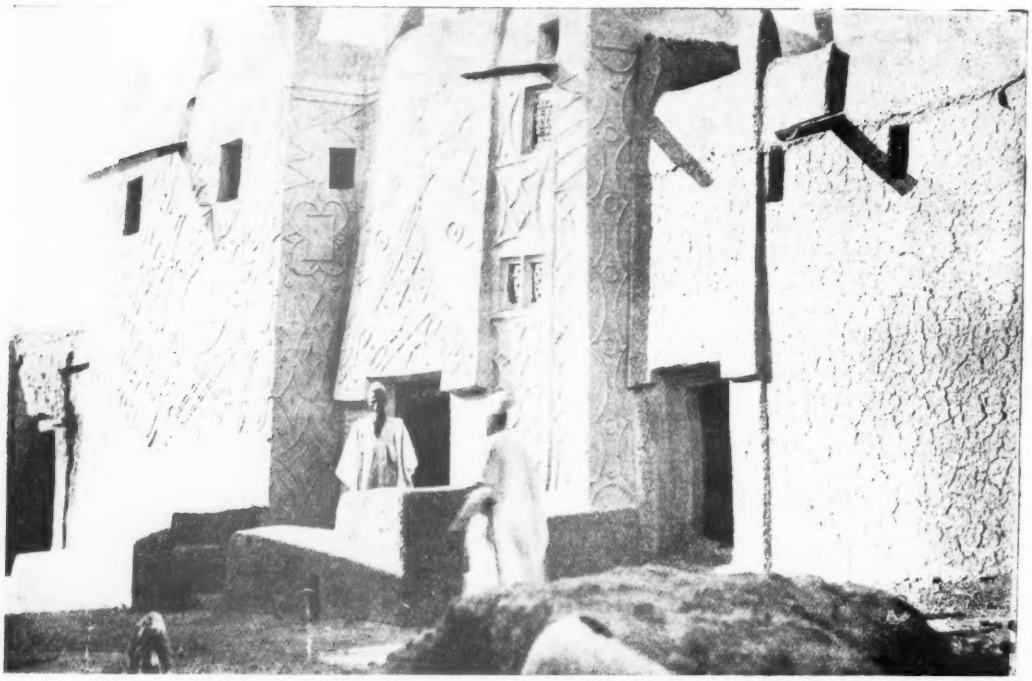


FIG. 6.—A MODERN HOUSE, KANO

In conclusion, I must express my indebtedness to Mr. Carrow, the Acting Resident, Mr. Muncaster, the Native Administration Engineer, and the Emir of Kano, for valuable information and assistance in obtaining access to many of the buildings I inspected.

Reviews

REPORT OF THE ROYAL COMMISSION ON LONDON SQUARES.* [*H.M. Stationery Office.*] 1928. 3*s.* 6*d. net.*

In so far as it is part of the work of a Royal Commission to make an investigation and survey, the Royal Commission on London Squares has done a most valuable piece of work, but in so far as it is the business of a Commission to weigh evidence in the light of human reasonableness and attack its problem with a view to amending old, and recommending new legislation, and not in sitting like a group of lawyers bent only on finding a verdict that shall rest on the solid foundation of existing legislation, it has done little to recommend itself. So meticulous has it been in its respect for existing legislation that the sum total of its recommendations seem to amount to nothing more than promoting legislation to consolidate existing legislation, and it has done very little more.

Naturally greatest interest lay in the kind of recommendations the Commission would make as to enacting legislation for the preservation of the squares as open spaces, it being a foregone conclusion that it would recommend the squares to be saved. The nice point was as to whether compensation was to be payable when a normal London square surrounded by streets was to be sterilised for building.

The recommendation of the Committee in this respect is that full compensation is to be paid for sterilisation from being built over, less betterment for retention as an open space payable by owners of surrounding property.

The members of the Commission were not unanimous in regard to this recommendation, two members not assenting. We are bound to admit that the findings of the Commission are disappointing, but still, after all, the mere fact of a Commission having reported and evidence having been submitted, will, in itself, be of very great value in stimulating authorities to take protective action, and in drawing the attention of the public to the great danger that exists.

In the Report the squares are classified under the following heads :—

1. Those that are protected under the Town Gardens Protection Act, 1863	Total	11
2. Those that are protected under the London Squares and Enclosures (Preservation) Act, 1916	,,	14
3. Enclosures owned by the Crown ..	,,	2
4. Enclosures owned by the City Corporation, L.C.C., or a Borough Council	,,	91
5. Enclosures subject to Special Act of Parliament	,,	63
6. Enclosures vested jointly in the Freeholders of adjoining houses or where there are other restrictive covenants against building	Total	53
7. Enclosure in private ownership free of statutory restriction and subject only to rights enjoyed by leaseholders of adjoining houses or other users ..	,,	223
8. Unclassified	,,	4
	Totals	461
	Acres	400

As regards those under 1 to 5 there is no danger.

Those under 6 are practically safe, with a safety that merely needs confirming by Statute.

Thus it is with the 223 which are free from restrictions, other than the restrictions of the leaseholders of adjoining houses and others, which may expire or be bought out at any moment, that public concern is felt. It is in regard to the preservation of these that we read with interest the findings of the Commission. These findings may be summed up as follows :—

1. Legislation is to be enacted providing for the retention of the squares.
2. The L.C.C. is to be the authority empowered to deal with all cases of compensation.
3. Full compensation is to be paid for sterilisation from being built over less betterment for retention as open space payable by owners of surrounding property.
4. Owners may use the subsoil for garages or other utilitarian purposes with the consent of the L.C.C. as to how this is done.
5. Owners may build over the squares provided they give an equal area elsewhere, and the exchange is approved by the London County Council.

Great responsibility will lie with the L.C.C. in regard to approving the use of the subsoil for garages ; and we are not quite sure if it would not have been better to have omitted all reference to such use altogether, leaving any such scheme to be done under a special Act of Parliament when its merits could be better ventilated, than in the Committee rooms of the L.C.C.

Unless such underground works with all their smell, noise, and rumblings were as underground as the tubes, and approached from entrances at the other side of the streets surrounding the squares and altogether out of the way, the peace and repose which characterise the London square would be completely lost as we are accustomed to regard peace and quietness to-day.

S. D. Adshead [*F.*].

*The members of the Commission were as follows: The Marquess of Londonderry (Chairman), Sir Howard George Frank, Dame Caroline Beatrix Bridgeman, Sir George Herbert Duckworth, Sir Henry Francis New, Maurice Linford Gwyer, Charles Hayward Bird, Kenyon Pascoe Vaughan-Morgan, Frank Briant, Frank Washington Hobbs, Ronald Collet Norman, Alfred George Prichard, Henry Snell, and Carmichael Thomas.

BURIED TREASURES OF CHINESE TURKESTAN. *By Albert von le Coq. Translated by Anna Barwell. [George Allen & Unwin, Ltd.]. Demy 8o 1928. 18s. net.*

This is an account of two expeditions into Chinese Turkestan under the leadership of Dr. Von le Coq, between 1902 and 1914. The book contains nearly a hundred photographic illustrations, both of the country in general and of treasures, frescoes, reliefs and manuscripts, found in ruined temples scattered all over the

countryside. The results of the expeditions lead to the conclusion that the earliest influences are clearly traceable to Greek culture and art which followed in the train of Alexander, many of whose mercenaries settled in the district and changed the population to one of mixed nationalities but of Greek civilisation, showing that wherever decaying Greek art comes into contact with a barbaric non-Greek religion, a new form of art arises. In the West, contact with Christianity produced the early Christian art (Greco-Christian) and in the East contact with Buddhism resulted in the early Buddhistic art (Greco-Buddhist). The similarity between these two expressions of art is in many cases amazing, and relief-groups so frequently found in Gandhara would, if characteristic Buddhistic additions had been removed, have represented equally well the carvings on an early Christian sarcophagus.

After many changes of rulership, sometimes coming from the East and at other times from the West, trade in this area in general suffered from the discovery of a sea route from China to Persia. The old silk routes fell into decay and the country, depopulated by the Mongol wars, gradually declined from its high level of civilisation. Those left behind found it possible no longer to maintain in working order the irrigation, upon which agriculture in this rainless country depends.

About the time of Charlemagne, the conquest of the country was begun by the Turks, who seem to have accepted the existing civilisation and Buddhism as well, but in after time were converted to Christianity and these people must, like their ancestors, be looked upon as a people of entirely Western civilisation. Their three religions, Buddhism, Manichaean and Christianity, are all of Western origin. Their writing is also of a Western source and they wrote with the reed pen of the Western peoples, and their medical knowledge, as far as we know, had also come from the West. The Chinese influence upon their civilisation was apparently mainly in externals, e.g., they used chop sticks and Chinese ink slabs and a paint brush for everyday writing.

At all periods when a strong dynasty occupied the throne, China garrisoned the silk routes and held sway over all the numerous small Indo-European Principalities. In spite of their power, however, it is impossible to find anywhere the slightest suggestion of Chinese influence in either the architecture, painting or sculpture of these subordinate peoples. All their forms are Indian or Iranian on a late classical basis. It must therefore be assumed that until about the fifth century A.D. no form of art had existed in China which could in the least have influenced the nations of Eastern Turkestan, who looked to the work of antique art for their inspiration.

The difficulties and dangers of the two expeditions are told in a very simple narrative form and the results of the expeditions and many " finds " in the ancient tombs of the country appear to have been collected and tabulated with the usual German thoroughness. Much of the ground covered by the expeditions was until then unexplored. The district has been under exploration since the last quarter of the nineteenth century, and more especially since Sven Hedin's exceptional daring and successful journeys showed the way to all later expeditions. A. B. T.

The Library

Notes by Members of the Literature Committee on Recent Purchases

[These Notes are published without prejudice to a further and more detailed criticism].

SOME ACCOUNT OF THE OLD HALL OF LINCOLN'S INN. By Sir John W. Simpson, K.B.E. 8o. Brighton. 1928. [Dolphin Press.] 8s. 6d.

The Honourable Society of Lincoln's Inn is to be congratulated on a notable piece of reinstatement and Londoners will be grateful that the Society's hall has been rescued from its sad state of disrepair and disfigurement and given back to us in something of its ancient beauty. Sir John Simpson's account of his work is excellently produced and we may forgive a certain *naïveté* which pervades his pages and seems to betray the novelty of the road which the distinguished architect has travelled. It might be suggested that the surgery applied to the principal rafters of the roof was harsh treatment and that the zeal which employed it was mistaken. His account of the design of this roof and of that at Hatfield, too, makes a claim for their rarity which can hardly be sustained. But the narrative of the work is frank and detailed, and is of real value as a record for the future. W. H. G.

LIFE IN RURAL ENGLAND. By W. C. Finch. 8o. Lond. 1928. [C. W. Daniel Co.] 10s. 6d.

This book, which deals with " Occupations and Pastimes in Field and Village, Farm and Home, Watermill and Windmill," is a rambling and very pleasant collection of reminiscences, quotations and pictures. The country described is for the most part Kent, which is perhaps England in little. What gives the book an especial interest is the collection of photographs, such as that of a miller dressing the mill stone, or the Roman miller proudly holding up his thumb flattened with much testing of flour, from a tombstone in the British Museum. The account of the development of the different sorts of mills is simple and informative. Altogether a pleasant book for those who like country things. H. C. H.

DEUTSCHE SCHMIEDEEISENKUNST. BAND V.: GEGENWART. By F. Stuttmann. Portfo. 4o. München. 1928. [Delphin.] £2 7s.

This is the fifth of a series of portfolios showing the development of German ironwork and is the number which contains the most modern work, the Forward Movement. It is interesting to see how much this " forward " movement looks backward for its technical inspiration, even when its " design " is cubist. It is the challenge of smiths' work as a handcraft performed by artists. Much of the book illustrates ironwork in churches, in screens and doors with figure work beaten and cut, in crosses and candlesticks : but perhaps the examples most fresh and interesting to us are the screens and stairrails, originating in the delightful provincial rococo ironwork of Germany's but in the hands of the modern craftsman taking an infinity of new and exciting shapes. A valuable book for students of modern architecture—but one which should be looked at in conjunction with the preceding volumes.

H. C. H.

ARCHITECTURAL DETAILS OF SOUTHERN SPAIN. By Gerstle Mack and Thomas Gibson. 4o. New York. 1928. [William Helburn, Inc.]

An excellent architectural book of Spanish details, with measured drawings and explanatory photographs. The letterpress has been rightly compressed and everyone of the 150 plates are of interest.

The authors rightly say that Spanish tradition lingers in the Southern States and this work should appeal to architects

in those parts, but this book should have a wider interest, as it gives details of interesting Spanish design of the early Renaissance as seen through the craftsmanship of local designers. It is well for many of us that pure Italian design was not adopted by the local magnates but that they had confidence in native talent, and no doubt they were proud of the results.

The illustrations include stone, wood and iron work, and scale drawings with measurements give the surface contours which are so pleasing to find in an architectural work.

A. E. H.

INTERIORS AU SALON DES ARTISTES DECORATEURS, Paris, 1928. Présentés par René Prou. 4o. Paris. 1928. [Charles Morcau.] 18s.

This portfolio of 48 loose plates, two or three in colour, is a record of the 18th Salon des Artistes Décorateurs held last year in Paris. The only letterpress is a short introduction in French by M. René Prou.

G. D. G. H.

Correspondence

LONDON SURVEY COMMITTEE.

Lancaster House,
St. James's, S.W.1.
15 *March* 1929.

To the Editor JOURNAL R.I.B.A.,—

DEAR SIR,—My Committee has asked me to thank you very much for the appreciative note which appeared in your JOURNAL relating to the work of the London Survey Committee. May I be allowed to add for the information of your readers that there are two things my Committee are in special need of at the present time :—

1. The assistance of architects (particularly students) in preparing the necessary measured drawings for forthcoming volumes ;
2. Additional subscribers to the work.

Owing to the expense of printing and the limited number of copies published it has been found necessary to raise the annual subscription to £2 2s., in return for which subscribers receive the current volumes. "Active" members, who assist regularly in the production of the volumes, obtain the publications free.—Yours faithfully,

PERCY W. LOVELL, *Secretary.*

WATER IN A VAULT.

3 *Hanover Square, W.1,*
11 *March* 1929.

To the Editor, JOURNAL, R.I.B.A.,—

DEAR SIR,—With reference to Mr. D. G. Millett's letter in regard to a damp vault, the moisture which has collected would be due to condensation and water from the new concrete. The temperature inside the vault would be higher than outside, which would assist to draw the moisture.

Ventilation is essential to the removal of the moisture-laden air, and two openings, inlet and outlet, would be required. If left unventilated the moisture will again be drawn back into the wall with reversal of relative temperatures in and outside ; also, the vault will quickly become musty and mould will form on the interior surface.

Unless the asphalte was laid in two coats the trouble may be aggravated by a bad junction between consecutive day's work.—Yours faithfully, E. J. TANNER [*F.*].

PROPOSED NEW BUILDINGS ON THE CALTON JAIL SITE, EDINBURGH.

The following letter has been addressed by the President of the Institute to the Prime Minister in connection with the proposed new buildings on the Calton Jail Site, Edinburgh :—

11 *March* 1929.

SIR,—I am directed by the Council of the Royal Institute of British Architects to bring to your notice the following resolution which was passed at their last meeting :—

"It is felt that it is specially incumbent upon those responsible for the design of all new public buildings of importance to ensure that they should possess the highest obtainable architectural qualities. In view of the national importance of the proposed new buildings on the Calton Jail Site, Edinburgh, the finest architectural skill available should be employed on their design, and the Council of the Royal Institute consider that this end can best be achieved by means of an open competition among architects."

The Council understand that important Government Buildings and the new Scottish National Library are to be erected on this magnificent site, and they desire to urge for the serious and sympathetic consideration of H.M. Government that the fullest advantage should be taken of this unparalleled opportunity of enriching the beauty of the capital of Scotland.

The question of the design of great national buildings is one with which the Royal Institute have been concerned for many years past, and I have no hesitation in saying that, as a result of a vast amount of practical experience, it has been found that the finest results cannot reasonably be hoped for unless the collective architectural ability of the country is brought to bear by means of a competition.

If designs are produced by one or more of a small group of departmental architects—however able and enthusiastic they may be—it is impossible to count on so fine a result as if the whole of the architectural talent of the country is given an opportunity of competing.

The principle of competition in the case of buildings of outstanding national importance is not only advocated by the Royal Institute and its Allied Societies, but has been accepted for many years by the National Government, and I am asked to express my Council's earnest hope that the usual practice will be followed in the case of the buildings now contemplated.—I am, sir, Your obedient servant,

(Signed) WALTER TAPPER,
President.

The Right Hon. Stanley Baldwin, P.C., M.P.

MEMORIAL TO BERTRAM GROSVENOR GOODHUE

The ceremony for the unveiling of the Memorial to Bertram Grosvenor Goodhue will take place at the Chapel of the Intercession, Broadway and 155th Street, New York, on Palm Sunday, 24 March.

Mr. Thomas Hastings, Royal Gold Medallist and Honorary Corresponding Member, will represent the Royal Institute at the ceremony.

Allied Societies

(The attention of Members of Allied Societies is particularly called to this page.)

THE GLOUCESTERSHIRE ARCHITECTURAL ASSOCIATION.

EXTRACTS FROM THE HONORARY SECRETARY'S REPORT FOR THE YEAR ENDING 21 FEBRUARY 1929.

The Gloucestershire Architectural Association has been asked to nominate members to serve on a panel to be appointed by the Wessex Society of Architects to co-operate with other nominees of the Council for the Preservation of Rural England, and to give free advice in approved cases in connection with various town planning matters, and with the Housing (Rural Workers) Act 1926. Since the appointment of this panel the Gloucestershire Rural Preservation Committee have suggested that such matters in the greater part of the county should be dealt with by them, with the help of Gloucestershire members of the Wessex Panel. An agreement is likely to be arrived at along those lines.

The Association has also appointed a panel of architects to give free advice, where circumstances justify it, to owners of cottages, and others contemplating building operations, but who are unable to bear the usual cost of professional advice. Some help along these lines has already been given.

At our meeting in December Captain Kirby, Organising Secretary of the Gloucestershire Rural Preservation Committee, spoke on the aims and objects of that body.

In October a meeting considered "Town and Regional Planning," and papers were read by C. W. Yates, and H. F. Trew.

The following have been appointed Honorary Members during the Session :—

Major-General Sir Fabian Ware, K.C.V.O., K.B.E., C.B., C.M.G.

F. L. Griggs, Esq., A.R.A.

Mr. E. A. Sallis Benney, A.R.C.A. (Lond.).

The Officers and Council of the Society for the year 1929-30 have been elected as follows :—

President, Thomas Falconer, F.R.I.B.A. ; Vice-President, H. T. Rainger, A.R.I.B.A. ; Hon. Secretary, Harold F. Trew, L.R.I.B.A. ; Hon. Assistant Secretaries, W. J. Rogers, A.R.I.B.A., F. C. Ravenhill ; Hon. Treasurer, D. N. London, L.R.I.B.A. ; Hon. Auditor, H. Ellis Moore, L.R.I.B.A. ; Members of the Council, E. Cole, A.R.I.B.A., H. Stratton Davis, F.R.I.B.A., A. L. Iredale, L.R.I.B.A., W. J. Rogers, A.R.I.B.A., C. W. Yates, A.R.I.B.A. ; Associate Members of Council, H. Ellis Moore, L.R.I.B.A., F. C. Ravenhill ; Representatives on Federal Council, H. Stratton Davis, F.R.I.B.A., A. L. Iredale, L.R.I.B.A., H. T. Rainger, A.R.I.B.A.

LIVERPOOL ARCHITECTURAL SOCIETY.

The Liverpool Architectural Society held their annual dinner in the Adelphi Hotel on Thursday, 14 March.

Mr. Walter Tapper, A.R.A., P.R.I.B.A., proposed the toast of the Society. He said the education of architects and students was being well done, but an even more important part was that of the layman. They had to do everything in their power to impress on the educational authorities that the study of architecture, and of the fine arts generally, should become part of the general education of the people.

The past year had seen for the first time a bill for the registration of architects pass through one House of Parliament. The profession had to build upon that foundation and see that they got a really good registration Act placed upon the Statute Book. It would be twenty years—perhaps longer—before the full benefits were felt.

Liverpool was one of the few great cities to which, when he came from London, he felt a little apologetic. It could boast so many things which London could hardly match. It had not hidden its docks. At the Pierhead it had commercial buildings to which London's, certainly on the Thames, were absolutely inferior. London had no public hall comparable to St. George's, and to-day Liverpool was putting up one of the finest ecclesiastical buildings in the world. But the surroundings of St. George's Hall were not quite worthy of that noble building, and when he looked at those blackened walls and columns he was sure Liverpool had not moved rapidly in smoke abatement. Even the comparatively new Cunard Building had taken on its coat of sooty grime. If there was a slum area in Liverpool—and he expected there was—the city could not really be worthy of its greatness.

The President, Mr. Duncan A. Campbell, in reply, said it was a great satisfaction to know that the city had called in the advice of two eminent architects with regard to the Mersey Tunnel entrances. He hoped this meant that at a later date they would see announced an architectural competition in that connection. Their society had now arranged a list of suitable lecturers to speak in elementary and public schools, and had approached the education authorities on the matter.

It was for them to consider very seriously the preservation of rural England. Round about Liverpool and particularly in Wirral, it was absolutely appalling to see the way in which cheap villas and nasty bungalows were spreading and being placed anywhere, haphazard. The only practical scheme he had so far heard of for tackling this problem had been put forward by Mr. Langdin and Mr. Grayson, and it was now before a committee of the Institute.

WEST YORKSHIRE SOCIETY OF ARCHITECTS.

Mr. G. H. Foggitt [*F.*], president, took the chair at a meeting of the West Yorkshire Society of Architects, held at Leeds on 28 February, when a lecture, entitled "The Great Houses of France," was delivered by Professor T. Harold Hughes [*F.*], Director of the School of Architecture, Glasgow.

In the course of his address, the lecturer said that a characteristic which, for want of a better term, we call "largeness of scale," has always been distinguishable in the architecture of France. A comparison of the Donjon at Loches with Castle Hedingham, or of the Château of Coucy with our own Conway Castle, at once shows the bolder manner of the French builders. The same comparison may be made with the thirteenth century cathedrals, and in the early days of the Humanist movement behind the trimmings of Italian detail the architecture of Azay-le-Rideau and of Chambord is bolder in its conception than that of Kirby or of Hatfield. It is not, therefore, altogether a matter of surprise that when the true architect emerged in the latter part of the sixteenth century we find him competent to deal with the larger problems of comprehensive planning and design in the classic theme.

Du Cerceau and De L'Orme are both worthy of study in the early period. Du Cerceau for the influence of his designs for châteaux with their accompanying gardens, and De L'Orme not only for his work at Anet and his great schemes for Chenonceaux and the Tuileries, but for his clear and logical views on all matters relating to building.

In the first half of the seventeenth century the names of Lemercier and F. Mansart were pre-eminent. Lemercier's great work was Richelieu, not alone his vast scheme for the château with its well-laid-out gardens but his plan for the château and the town, the whole definitely planned as one great architectural conception. Mansart's plan for the château and village of Balleroy, though never fully carried out, is a more mature design. Its particular excellence lies in the lines of the plan and the subordination of minor buildings and details to the effect of the composition as a whole. Maisons is no finer in general conception, though the detail reaches a higher level.

The competition for the Louvre and the advent of Bernini marks another period, that of Louis XIV. Whatever may have been the demerits of Bernini's design for the new palace, his plan was conceived on a bigger scale than anything that had been seen in France before. Simultaneously in town planning and garden design new influences were at work. Vauban—soldier, engineer, architect and patriot—aided by Colbert, was enabled to combine with his fortifications well-laid-out towns within the walls. His attitude towards his military work is well expressed when he says that gateways should not only be strong but " that they should be such that the enemy might judge of the magnificence of the King."

Le Nôtre, in his garden designs, showed a grasp of planning on a large scale that is remarkable. The gardens of Vaux-le-Vicomte, Chantilly, Versailles and Marly are works that have never been equalled. All are characterised by great breadth of treatment, prolonged vistas and a knowledge of the big principles of design, and all are planned so that the houses they adorn may gain by their setting. Marly, a work in which Le Nôtre, J. H. Mansart and Le Brun were associated together with many famous sculptors, painters and craftsmen, is, of all examples of monumental planning, one of the most striking.

J. F. Blondel is of interest on account of his influence over the younger architects of the time, and the fact that his work extended to Germany. French influence was strong in Germany, and towards the end of the eighteenth century Ixnard prepared a most monumental scheme for a palace for the Elector at Coblentz.

Monumental architecture was not limited to Paris. At Nancy, in linking together the new and old towns, one of the finest schemes of the Renaissance was produced. The work at Nancy was almost contemporary with the competition for the Place Louis XV. The design by Gabriel was ultimately chosen and modified and now forms the Place de la Concorde. The church of the Madeleine as carried out under Napoleon, is not so effective as part of Gabriel's design as would have been the contemporary design of Contant d'Ivry.

The beautifying of Paris in the nineteenth century was only rendered possible by a tradition which the French had slowly built up, a tradition of monumental design which rises far higher than petty questions of style and detail.

Mr. J. Addison [*A.*], head of the Leeds School of Architecture, in proposing a vote of thanks to the lecturer, said he thought the age of fine sculpture in France was largely instrumental in inspiring the architects of that period to achieve their designs in a grand and monumental manner. In those days culture went happily hand in hand with wealth.

Mr. F. W. H. Allison [*A.*] seconded the vote of thanks.

Students of the Leeds School of Architecture held a debate at the Leeds headquarters of the above Society on 7 March, when the subject for discussion was " That future progress in Architecture can only be attained by revolutionary means."

For the affirmative, Mr. H. R. M. Walker said that architects of to-day ought to seek for self-expression rather than continue to copy old styles. What was needed to-day was architecture of the pioneer type, for it was only by such work that any progress could be made. To-day, Sweden and Germany were the only countries encouraging architecture that could be called expressive.

Mr. F. Senior, for the negative, said there was no need to launch fearsome new designs on the sea of English architecture. While he did not admire mere reproductions of the past, it was undesirable that they should produce nightmare-like designs, such as some of those by Corbusier. He saw no need for revolutionary change.

Mr. Alban Jones [*L.*] doubted if a Corbusier house would be as comfortable to live in as a Yorkshire manor house. Pending the appearance of the man who could show something that was revolutionary and good, as were the works of Voysey, revolutionary methods were to be deprecated.

Mr. J. W. Lee, Mr. F. Chippindale [*A.*], Mr. Victor Bain [*F.*], Mr. Leonard Whitaker (chairman), Mr. W. Whitehead [*A.*], Mr. H. Sidebottom, and Mr. G. L. Broadbent [*A.*], also spoke.

YORK AND EAST YORKSHIRE ARCHITECTURAL SOCIETY.

The York and East Yorkshire Architectural Society held their annual dinner in the Guildhall, Hull, on 7 March 1929. Mr. J. Stuart Syme, F.R.I.B.A., President of the Society, was in the chair.

After the toast of the City and County of Kingston-upon-Hull was replied to by the Lord Mayor, the toast of " The Royal Institute of British Architects " was proposed by Mr. G. Dudley Harbron, vice-president of the Society.

Mr. W. Tapper, A.R.A., the president of the R.I.B.A., replying, announced that preparations were in progress for the annual conference of the Institute to be held at York in June. He went on to say that if the voice and the pen of the prophet of beauty was necessary in the famous and beautiful city of York, it was much more necessary in great industrial centres and cities such as Hull. Here with their docks and shipping and their factories it might be more natural to think that the people were so busy accumulating wealth that they had little time to turn their minds and thoughts to the dignity and beauty of their surroundings. He was glad to say that this was not always the case, as was evidenced in Cardiff, Liverpool, and Southampton.

He knew something of what had been done in Hull to make it a finer city. The work of men like Sir Alfred Gelder would never be forgotten, but he was sure that not only the architects of Hull, but also those who had the vision, would agree that until something more was done they could not rest satisfied, and that many schemes of improvement and development must be undertaken before this famous seaport could claim to be worthy of its great wealth and fame.

He understood the Corporation was now considering some very important proposals and that a complete new street might be the outcome. He was delighted to hear it. He believed there was no more inspiring task that could be undertaken by a corporate body such as theirs. They must bring to bear upon it, however, the finest architectural ability that could be found in this country. If he might make a suggestion, without presumption, he would advise the Corporation to consult the York and East Yorkshire Architectural Society, the members of which understood the pros and cons and the special needs of the city and were just as keenly interested as they themselves in the development of Hull.

It was often urged that there was not the money to carry out these schemes, but Mr. Tapper dissented from this view and pointed out that money was being spent in dog racing and dirt track racing, at cinemas and at golf, and they saw on every hand, he said, that money was spent lavishly. A mere fraction of that money, spent in the development and the beautifying of their cities and towns, would make England a place worthy to live in, and in a generation would produce results which would amaze those of little fath in architecture. Personally, he had been preaching the education of the public ever since he was elected to the office of the president of the Royal Iustitute of British Architects. The reason why we had

ugly places and mean streets and the squalor of it all was because people had never been taught in their schools, colleges and universities that the thing really mattered. He was glad the education authorities of the country were seconding their efforts in this direction.

Mr. C. M. E. Hadfield, president of the Sheffield and South Yorkshire District Society of Architects, submitted the toast of the York and East Yorkshire Architectural Society, and Mr. J. Stuart Syme replied.

STUDENTS R.I.B.A.

The following were elected as Students at the meeting of the Council held on 4 March, 1929 :—

BEVAN : CHARLES SHERLOCK, 49 Waldemar Avenue, Ealing, W.13. (Architectural Association.)

CARVER : HUMPHREY STEPHEN MUMFORD, 34 Bedford Square, London, W.C.1. (Architectural Association.)

CASSELS : GEORGE ARTHUR, 1 Corstorphine Park Gardens, Midlothian, Scotland. (Edinburgh College of Art.)

COX : WILLIAM JOHN PATERSON, 3 Allenby Road, Forest Hill, London, S.E.23. (Northern Polytechnic.)

ILES : JOHN BIRD, "The Gap House," Broadstairs, Kent. (Cambridge University.)

JACKSON : HERBERT, 221 Holyhead Road, Handsworth, Birmingham. (Birmingham School of Architecture.)

MACKNESS : ARTHUR REGINALD, 47 Apsley Road, Clifton, Bristol. (R.W.A., Bristol.)

MOFFAT : JOHN BURN, 120 Main Street, Spittal, Berwick. (Edinburgh College of Art.)

NEIL : NORMAN ALEXANDER GORDON, 47 Morton Street, Joppa, Midlothian. (Edinburgh College of Art.)

REA : HERBERT FRANCIS, 10 Barkston Gardens, London, S.W.5. (University of London.)

SCOTT : ROBERT DUNCAN, Rudloe, Park Avenue, Watford. (Architectural Association.)

WEBSTER : PATRICIA BEATON, 18 Upper Bedford Place, London, W.C.1. (University of London.)

NOTES FROM THE MINUTES OF COUNCIL.

4 *February* 1929.

BRITISH ARCHITECTS' CONFERENCE 1930.

On the recommendation of the Allied Societies' Conference it was decided to hold the British Architects' Conference at Cambridge in 1930.

THE PRELIMINARY EDUCATION REQUIRED FOR AN ARCHITECT (WITH SPECIAL REFERENCE TO THE INCLUSION OF MORE ART SUBJECTS IN THE CURRICULUM OF SECONDARY SCHOOLS).

On the recommendation of the Board of Architectural Education it was decided to make representations with a view to the inclusion of Drawing and/or Art as an optional subject in the following Examinations :—

The Higher School Examination, University of London.

The Higher School Examination, University of Bristol.

The Matriculation Examination, University of Durham.

The Higher School Examination, University of Durham.

Responsions, University of Oxford.

Previous Examination, University of Cambridge.

The Matriculation Examination, University of Wales.

(Drawing is included as an optional subject in other similar Examinations.)

R.I.B.A. EXAMINATIONS OVERSEAS.

The Board reported the following results :—

1. *The Examination in Professional Practice, Shanghai.*—Examined, 1 ; Relegated, 0 ; Passed, 1.
2. *The Final Examination (Design Section), Perth, W. Australia.*—Examined, 1 ; Relegated, 1 ; Passed, 0.
3. *The Final Examination (Design and Town Planning Sections), Kenya.*—Examined, 1 ; Relegated in Design, 1 ; Passed in Town Planning, 1.
4. *The Intermediate Examination, Johannesburg.* Examined, 2 ; Relegated, 2 ; Passed, 0.
5. *The Special Examination, Johannesburg.*—Examined, 3 ; Relegated, 0 ; Passed, 3.

THE GOVERNMENT OF BOMBAY DIPLOMA IN ARCHITECTURE EXAMINATION 1929.

Professor Claude Batley was appointed as the representative of the R.I.B.A. on the Board of Examiners for the Bombay Art Examinations.

PRIZES AND SCHOLARSHIPS.

The R.I.B.A. (Alfred Bossom) Travelling Studentship, 1929.—The report on "American Hotels," submitted as the result of his tour by Mr. Patrick Cutbush [*A.*], R.I.B.A. (Alfred Bossom) Travelling Student, 1928, was approved.

The Henry Saxon Snell Prize, 1927. The report on "Modern Hospital Construction," submitted as the result of his tour by Mr. G. R. Dawbarn, Henry Saxon Snell Prizeman, 1927, was approved.

The Soane Medallion and the Victory Scholarship.—On the recommendation of the Board it was decided to empower the Examiners in Design in the R.I.B.A. Final Examination to select from each of the two previous R.I.B.A. Final Examinations one candidate for admission direct to the Final stage of the competition for the Soane Medallion or the Victory Scholarship if, in their opinion, any candidate reaches a sufficiently high standard in design.

THE R.I.B.A. VISITING BOARD.

Professor A. E. Richardson was appointed as a member of the R.I.B.A. Visiting Board.

THE ROYAL SANITARY INSTITUTE CONGRESS 1929.

Mr. H. D. Searles-Wood [*F.*] and Mr. C. M. E. Hadfield [*F.*] were appointed as the R.I.B.A. delegates at the fortieth Congress and Exhibition of the Royal Sanitary Institute to be held at Sheffield from 13 to 20 July 1929.

COUNCIL OF ENQUIRY INTO THE BUILDING INDUSTRY.

Mr. Sydney Tatchell [*F.*] was appointed to represent the R.I.B.A. on the Executive Committee of the newly formed Council of Enquiry into the Building Industry.

BRITISH ENGINEERING STANDARDS ASSOCIATION TECHNICAL COMMITTEE B/G 9—CAST IRON PIPES FOR HEATING, VENTILATING AND HOUSE DRAINAGE.

Mr. G. R. Farrow [*F*] and Mr. H. F. Hooper [*F.*] were appointed as the R.I.B.A. representatives on the above Committee of the B.E.S.A.

THE MANCHESTER SOCIETY OF ARCHITECTS.

The affiliation of the Blackpool and Fylde Architectural Society to the Manchester Society of Architects was approved.

THE FELLOWSHIP.

The Council, by a unanimous vote, elected the following architects to the Fellowship under the powers defined in the Supplemental Charter of 1925 :—

Mr. Norman Dick (Glasgow).
Mr. A. H. Chapman (Toronto).
Mr. Ernest Cormier (Montreal).
Mr. George T. Hyde (Montreal).

MEMBERSHIP.

The following ex-member was reinstated :—

As Associate : Harry Tom Boden Spencer.

RESIGNATIONS.

The following resignations were accepted with regret :

Arnold Mitchell [*F.*]
Arthur Kent [*L.*]
James Lowson [*L.*]
Edward Andreas Pearce [*L.*]
John Ernest Reid [*L.*]

APPLICATIONS FOR ELECTION AS LICENTIATES UNDER SECTION III (F) OF THE SUPPLEMENTAL CHARTER OF 1925.

Three applications were approved.

Notices

THE ELEVENTH GENERAL MEETING.

The Eleventh General Meeting (Ordinary) of the Session 1928–29 will be held on Monday, 8 April 1929, at 8 p.m., for the following purposes :—

To read the Minutes of the General Meetings (Special and Business) held on Monday, 18 March 1929; formally to admit members attending for the first time since their election.

To read the following Paper : "The Work of the Imperial War Graves Commission," by Major-General Sir Fabian Ware, K.C.V.O., K.B.E., C.B., C.M.G. [*Hon. Associate*].

R.I.B.A. DEBATES BETWEEN ARCHITECTS AND SPECIALISTS.

The following is the programme for the remaining debate :—

Tuesday, 23 *April* 1929, *at* 5.30 *p.m.*—

Subject : "Organisation."

Speakers : Mr. Matthew Hill (Messrs. Higgs and Hill).
Mr. Maurice E. Webb, D.S.O., M.C., F.R.I.B.A.

It is hoped that as many as possible will attend the debate and that the discussion will be general and useful.

THE ROYAL GOLD MEDAL FOR ARCHITECTURE;

At a Special General Meeting of the Royal Institute of British Architects on 18 March, Monsieur Victor Alexandre Frédéric Laloux, R.I.B.A. Honorary Corresponding Member, of Paris, was elected by the Members, and his name has been submitted to His Majesty the King as a fit recipient of the Royal Gold Medal for Architecture for the year 1929.

The Medal was presented last year to Mr. Edward Guy Dawber, A.R.A., F.S.A., Past-President of the R.I.B.A.

ASSOCIATES AND THE FELLOWSHIP.

Associates who are eligible and desirous of transferring to the Fellowship class are reminded that if they wish to take advantage of the election to take place on 10 June 1929, they should send the necessary nomination forms to the Secretary R.I.B.A. not later than Saturday, 13 April 1929.

LICENTIATES AND THE FELLOWSHIP.

The attention of Licentiates is called to the provisions of Section IV, Clause 4 (b) and (cii), of the Supplemental Charter of 1925. Licentiates who are eligible and desirous of transferring to the Fellowship can obtain full particulars on application to the Secretary R.I.B.A., stating the clause under which they propose to apply for nomination.

PROPOSED TOUR TO THE UNITED STATES AND CANADA.

It will be remembered that an announcement was made in the JOURNAL some little time ago regarding a proposed visit to America, and the Secretary has pleasure in announcing that arrangements have now been completed for a party of members of the Institute and Allied Societies to make a short trip to the United States and Canada in July next.

The party will sail from Liverpool for New York by the Cunard liner *Laconia* on 13 July, and will return from Quebec by the *Ascania* on 3 August, arriving in Plymouth 10 August, and London on 11 August. The places visited on the other side will include :—

New York—Washington—Detroit—Niagara Falls—Toronto—Montreal—Quebec

the trip from Toronto to Montreal being made by steamer down the River St. Lawrence, passing the Thousand Islands *en route*.

The cost of the trip will be approximately £95, this figure including cabin class accommodation on the above mentioned steamers, rail fares in the U.S.A. and Canada, hotel accommodation (exclusive of meals ashore), sight-seeing trips, etc., and it is believed the trip will prove most attractive.

The Secretary R.I.B.A. will be glad to hear from those members who are interested and to forward a detailed itinerary of the tour on request.

Relatives and friends of members will be welcomed.

THE ANNUAL CONFERENCE OF THE R.I.B.A. AND ALLIED SOCIETIES.

All Members and Students of the R.I.B.A. and all Members of the Architectural Association and of the Allied Societies are cordially invited to attend the Conference to be held in York from 12 to 15 June 1929, inclusive. Further particulars will be issued in due course.

EXHIBITIONS IN THE R.I.B.A. GALLERIES.

1. *Design for a Garage in the Theatre Area of London.*
2. *Design for a National Sign for Petrol Filling Stations and Garages.*

The designs submitted in the above R.I.B.A. Competitions will be exhibited in the R.I.B.A. Galleries from Tuesday, 9 April, to Saturday, 20 April 1929, inclusive, during the hours of 10 a.m. and 8 p.m. (Saturdays, 10 a.m. to 5 p.m.).

BRISTOL CORPORATION ACT, 1926. SECTION 88.

The President has appointed Mr. G. C. Lawrence [*F.*] as the architect-member of the Advisory Committee for the purpose of assisting the Corporation of Bristol in the exercise of the power of approving or disapproving elevations of buildings.

R.I.B.A. STATUTORY EXAMINATIONS

The R.I.B.A. Statutory Examinations for the Office of District Surveyor under the London Building Acts, or Building Surveyor under Local Authorities, will be held at the R.I.B.A., London, on 1, 2 and 3 May, 1929.

The closing date for receiving applications for admission to the Examinations, accompanied by the fee of £3 3s., is 10 April, 1929.

Full particulars of the Examinations and application forms can be obtained from the Secretary R.I.B.A.

Competitions

PROPOSED NEW HALL, THE MOUNT SCHOOL, YORK.

The "Promoters," the Committee of the Mount School, invite Architects who are members of the Society of Friends or those who have at one time attended either the Bootham School or the Mount School, York, to submit designs in competition for a New Hall, proposed to be erected on a site adjoining Dalton Terrace.

Assessor: Mr. J. Mansell Jenkinson [*A.*].

Premiums: £50, £30 and £20.

Last day for questions: 1 March 1929.

Last day for sending in designs: 24 April 1929.

Conditions and site plan may be obtained on application to Dr. C. E. Hodgson, The Mount School, York.

COMPETITION FOR THE COLUMBUS MEMORIAL LIGHTHOUSE.

A copy of the report containing complete details of the conditions governing the above competition has been received in the R.I.B.A. Library. Members who desire to enter the competition are required to fill up a registration form and return it to the Pan American Union, Washington. A number of forms are being sent to the R.I.B.A., and can be obtained from the Secretary as soon as they are received. Preliminary details of the competition were published in the R.I.B.A. JOURNAL, 14 July 1928.

SIMON BOLIVAR MEMORIAL.

PRELIMINARY DETAILS OF A COMPETITION FOR THE ERECTION OF A MONUMENT TO THE LIBERATOR BOLIVAR IN THE CITY OF QUITO.

A competition has been opened for the erection in Quito of a monument to Bolivar.

The Ecuadorean Minister in Paris and two members of the Sociedad Bolivariana of Quito, residing in Paris, will form a Committee to organise and carry out the said competition.

A jury of four members, composed of experts, artists and art critics will judge the works presented.

The designs, "Esbozos" (drawings or sketches), "maquettes," etc., which it is desired to present must be forwarded to the Legation of Ecuador, 91 Avenue Wagram, Paris, not later than 31 March 1929.

The sum of 2,000,000 French francs is available for the purpose of erecting the monument. This sum includes the fees of the artist who will carry out the work, either by himself or with others acting under his direction.

Honourable mention will be awarded to the authors of the designs adjudged second and third.

The decision of the Jury will be submitted to the Sociedad Bolivariana, of Quito, for ratification, prior to the contract with the author of the selected design being signed.

Members' Column

MR. HERBERT J. AXTEN.

MR. HERBERT J. AXTEN, F.R.I.B.A., has recently been appointed the Architect to the Westminster Bank, Limited, 51 Threadneedle Street, London, E.C.2. Telephone: London Wall 6122.

Mr. F. J. Garlick, who had held this position for several years, retired at the end of last December.

MR. JAMES CARRICK.

MR. JAMES CARRICK, L.R.I.B.A., for over thirty years associated with the late Mr. James Kennedy Hunter, F.R.I.B.A., architect, Ayr, begs to announce that he has assumed private practice at 35A Sandgate, Ayr, as from 23 February 1929.

PARTNERSHIPS WANTED.

YOUNG, energetic Architect is anxious to obtain a partnership in an established practice in London or Eastern Counties. Some capital available.—Apply Box 7329, c/o The Secretary R.I.B.A., 9 Conduit Street, London, W.1.

PARTNERSHIP required, in London or Kent district, by A.R.I.B.A. with wide and exceptional experience as designer and detailer of high-class domestic, bank, and office buildings. Highest references.—Apply Box 1128, c/o The Secretary R.I.B.A., 9 Conduit Street, London, W.1.

ASSISTANCE OFFERED.

A.R.I.B.A. having considerable civil, mechanical, and electrical engineering experience, together with extensive plant, furnace, and the construction of industrial buildings, is open to advise members on all matters in connection with industrial plant work.—Replies to Box 1139, c/o The Secretary R.I.B.A., 9 Conduit Street, London, W.1.

OFFICE TO LET.

Two rooms, self-contained, partly furnished, second floor, John Street, Bedford Row. £80 per annum, 10s. per week for heating and cleaning. Elcetric lighting by sub-meter.—Box 4205, c/o The Secretary R.I.B.A., 9 Conduit Street, London, W.1.

OFFICE ACCOMMODATION.

SENIOR member, with offices in the Temple, offers drawing accommodation and address to one or more junior members commencing practice, at a moderate rent, or alternatively to share his offices (not running expenses) with another member of the R.I.B.A.—Apply Box 1719, c/o The Secretary R.I.B.A., 9 Conduit Street London, W.1.

F.R.I.B.A. wishes to share his office with another; very moderate rental. Close Victoria Street and Queen Anne's Gate.—Apply Box 9329, c/o The Secretary R.I.B.A., 9 Conduit Street, London, W.1.

FELLOW of the Institute, with a West End office, having a room to spare, desires to meet another Architect with a view to sharing accommodation and running expenses.—Apply Box 7474, c/o The Secretary R.I.B.A., 9 Conduit Street, London, W.1.

F.R.I.B.A., with an office in the West End, desires to meet another Architect with a view to sharing accommodation and running expenses.—Apply Box 2118, c/o The Secretary R.I.B.A., 9 Conduit Street, London, W.1.

ACCOMMODATION WANTED.

ARCHITECT wishes to obtain small office accommodation or share of an office in the West End, Victoria, or Westminster district.—Apply Box 6329, c/o The Secretary R.I.B.A., 9 Conduit Street, London, W.1.

Minutes XIV

SESSION 1928–1929.

At a Special General Meeting, held on Monday, 18 March 1929, at 8.0 p.m., Mr. Walter Tapper, A.R.A., President, in the chair. The attendance book was signed by 24 Fellows (including 12 members of Council), 12 Associates (including 3 Members of Council), 7 Licentiates (including 3 Members of Council), and 1 Hon. Associate.

The Minutes of the Special General Meetings held on 8 and 25 January 1929 having been published in the JOURNAL, were taken as read, confirmed, and signed as correct.

The President announced the object of the meeting, viz., to elect the Royal Gold Medalist for the current year.

On the motion of the President it was RESOLVED by acclamation :—

> That, subject to His Majesty's gracious sanction, the Royal Gold Medal for the promotion of Architecture be presented this year to Monsieur Victor Alexandre Frédéric Laloux, Honorary Corresponding Member, of Paris, in recognition of the merit of his work as an architect.

The Special General Meeting then terminated.

Minutes XV

At the Tenth General Meeting (Business) of the Session 1928-29, held on Monday, 18 March 1929, immediately after the Special General Meeting above recorded and similarly constituted, the Minutes of the Ninth General Meeting held on Monday, 4 March 1929 having been published in the JOURNAL were taken as read, confirmed, and signed by the President.

The following members attending for the first time since their election were formally admitted by the President :—

Mr. Hugh Davies [Hon. Associate].

Mr. Seymour C. Arding [Licentiate].

The following candidates for Membership were elected by show of hands :—

AS FELLOWS [10].

BRADSHAW : HAROLD CHALTON [*A.* 1918].

CABLE : CHARLES JOHN [*A.* 1920], Sevenoaks.

IRWIN : LEIGHTON FRANCIS [*A.* 1920], Melbourne, Australia.

MYER : Lieut.-Colonel GEORGE VAL [*A.* 1905].

STEELE : HAROLD ROOKSBY [*A.* 1925].

STEVENSON : ROY KENNETH [*A.* 1920], Melbourne, Australia.

TROUP : Major ROBERT JAMIESON, M.A., Croix de Guerre [*A.* 1922].

And the following Licentiates who pave passed the qualifying Examination :—

MITCHELL : CECIL THOMAS, Kampala, Uganda.

WILSON : FREDERICK CANDELENT, Trichinopoly, South India.

And the following Licentiate who is qualified under Section IV, Clause 4, cii, of the Supplemental Charter of 1925 :—

TAYLOR : THOMAS, Oldham.

AS ASSOCIATES [40].

ALEXANDER : ANDREW GORDON [Final].

ASPLAND : ARTHUR [Passed five years' course at Liverpool University School of Architecture. Exempted from Final Examination after passing examination in Professional Practice], Windermere.

AYERST : CHARLES THOMAS [Final].

BANKS : PERCY HAROLD, P.A.S.I. [Special], Brighton.

BEALE : EDWARD HAYLEY [Passed five years' course at the Architectural Association. Exempted from Final Examination after passing Examination in Professional Practice], Burwash.

BEGG : KENNETH ANDREW [Passed five years' course at the Edinburgh College of Art. Exempted from Final Examination after passing Examination in Professional Practice], Edinburgh.

BERTRAM : STEPHEN NOEL [Passed five years' course at the Architectural Association. Exempted from Final Examination after passing Examination in Professional Practice].

BROWN : JOHN SHERWOOD [Special], Winchester.

BROWN : ROBERT NEVILLE [Final], South Shields.

BUTLING : GEORGE ALBERT [Passed five years' course at Liverpool University School of Architecture. Exempted from Final Examination after passing Examination in Professional Practice].

CADMAN : HARRY GEORGE [Final], Folkestone.

CARR : FRANK HENRY [Final].

CARR : TERENCE [Final].

CARTWRIGHT : THOMAS NELSON [Final], Nottingham.

COBB : ANDREW RANDALL [Special Exemption], Halifax, Nova Scotia.

COCHRANE : JOSEPH BRIAN [Passed five years' course at the School of Architecture, University of London. Exempted from Final Examination after passing Examination in Professional Practice], Wolverhampton.

COLEMAN : JOHN JAMES [Final], Sunderland.

DANIEL : TREVOR MERVYN [Final], Abersychan, Mon.

EDWARDS : ARTHUR STANLEY [Special], Birmingham.

HALL : DOUGLAS [Passed five years' course at Liverpool University School of Architecture. Exempted from Final Examination after passing Examination in Professional Practice], Bangor, North Wales.

HAMILTON : ARCHIBALD OLIPHANT [Passed five years' course at the Glasgow School of Architecture. Exempted from Final Examination after passing Examination in Professional Practice], Glasgow.

HARRISON : GEOFFREY STANLEY [Passed five years' course at the Architectural Association. Exempted from the Final Examination after passing Examination in Professional Practice], Radlett, Herts.

HOWES : JAMES FREDERICK [Final], Hertford.

JOHNS : BERNARD WINTON [Final].

KIDD : HENRY DOUGLAS [Special].

LAW : OLIVER WILLIAM MAFEKING [Final].

LE HUNTE : LEONARD [Final].

MACGILLIVRAY : IAN DONALD [Passed five years' course at Liverpool University School of Architecture. Exempted from Final Examination after passing Examination in Professional Practice], Bulawayo, South Rhodesia.

MANDERSON : FREDERICK KEITH, B.Arch. [Final].

MORANT : CLIVE AUBREY LUSHINGTON [Special].

STEELE : ALEXANDER [Passed five years' course at the Edinburgh College of Art. Exempted from Final Examination after passing Examination in Professional Practice], Bo'ness, West Lothian.

SUMNER : BEVIS ALEXANDER [Passed five years' course at Liverpool University School of Architecture. Exempted from Final Examination after passing Examination in Professional Practice], Heswall, Cheshire.

THEWLIS : EDWARD CHARLES [Final], Southend-on-Sea.

TOMKYNS : HAROLD GLENCOE [Special], Johannesburg, South Africa.

USHER : WILFRED [Final], Chester-le-Street, Co. Durham.

VINE : CYRIL MALCOLM [Final].

WALTON : DONALD GARBUTT [Final].

WATSON : WALTER [Final], Birmingham.

WATT : JOHN [Final], Wakefield.

WHYTE : WILLIAM GEORGE [Passed five years' course at Robert Gordon's Colleges, Aberdeen. Exempted from Final Examination after passing Examination in Professional Practice], Johannesburg, South Africa.

AS HON. ASSOCIATE [1].

WOODWARD: ARTHUR MAURICE, M.A. F.S.A., Director of the British School of Archæology at Athens.

AS HON. CORRESPONDING MEMBER [1].

HORTA: VICTOR PIERRE, Architecte, Professeur honoraire à l'Université Libre de Bruxelles, Directeur et Professeur à l'Académie Royale des Beaux-Arts de Bruxelles, ancien titulaire du Cours d'Architecture à l'Institut Superieur des Beaux-Arts à Anvers, Membre de l'Académie Royale de Belgique, Membre de la Commission Royale des Monuments, etc., etc., Bruxelles.

The Chairman announced that by a resolution of the Council Mr. George Christopher Wingrove had ceased to be an Associate of the Royal Institute.

The Business (Ordinary) General Meeting then terminated.

Minutes XVI

At a Special General Meeting held on Monday, 18 March 1929 immediately after the Business General Meeting above recorded and similarly constituted.

The President announced that the meeting had been summoned for the purpose of considering resolutions authorising the Council to purchase premises situated in Portland Place, W.1, as a site for the erection of new premises for the R.I.B.A. and called upon Lt.-Col. P. A. Hopkins to explain the resolutions. A discussion ensued* and on the motion of Lt.-Col. P. A. Hopkins, seconded by the Hon. Secretary it was unanimously Resolved:—

(1) That the Council be authorised to confirm the undermentioned Contracts for the purchase of properties in Portland Place, London, W.1., viz.:—

(*a*) A Contract entered into by Colonel Percy Hopkins on behalf of the Institute to purchase at the price of £6,000 the premises No. 62 Portland Place held under a lease dated 20 March 1903 from the Rt. Hon. Thomas Evelyn Baron Howard de Walden and Seaford for the unexpired residue of a term of 27 years from 6 July 1911 and subject to the payment of the yearly rent of £110 and to the Lessees covenants and conditions contained in the said Lease and also the benefit of an Agreement dated 18 November 1921 for the grant of a further Lease of the said premises for the term of five years from 6 July 1938 subject to the payment of the yearly rent of £110 and to the Lessees covenants and conditions therein contained.

(*b*) A Contract entered into by William Scorer, Esq., on behalf of the Institute to purchase at the price of £9,100 the premises No. 64 Portland Place held under a Lease dated 8 May 1903 from the Rt. Hon. Thomas Evelyn Baron Howard de Walden and Seaford for the unexpired residue of the term of 40 years from the 6 July 1903 subject to the payment of the apportioned yearly rent of £100 and to the Lessees covenants and conditions contained in the said Lease.

(*c*) A Contract entered into by Frederick George Baker, Esq., on behalf of the Institute to purchase at the price of £5,000 the premises No. 68 Portland Place held under a Lease dated 2 November 1921 from the Rt. Hon. Thomas Evelyn Baron Howard de Walden and Seaford for the unexpired residue of a term of 13¾ years subject to the payment of the yearly rent of £300 and to the Lessees covenants and conditions contained in the said Lease.

(2) That the Solicitors to the Institute be instructed to complete the purchase of the respective properties above-mentioned and that the Council be further authorised to raise out of the funds of the Institute or by Mortgage such a sum or sums as may be required for the completion of the said properties.

(3) That the Secretary be authorised to accept the terms offered by Colonel Edward Blount on behalf of the Rt. Hon. Thomas Evelyn Baron Howard de Walden and Seaford as contained in his letters to the Secretary of the 5 and 19 February 1929 for the grant of a Building Lease of the site of Nos. 62, 64, 66 and 68 Portland Place; Nos. 14, 16, 18 and 20 Weymouth Street; and Nos. 14 and 15 Williams Mews, London, W.1.

The President expressed to Lt.-Col P. A. Hopkins the cordial thanks of the meeting for the manner in which he had conducted the negotiations for the acquisition of the site.

The formal business of the Special General Meeting having concluded, the President invited members to join in a private and informal discussion on subjects of professional interest or difficulty.

The meeting terminated at 9 p.m.

* A report of the Meeting will be published in the next issue of the Journal.

It is desired to point out that the opinions of writers of articles and letters which appear in the R.I.B.A. JOURNAL must be taken as the individual opinions of their authors and not as representative expression of the Institute.

R.I.B.A. JOURNAL.

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